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VIEWS, NEWS AND INTERVIEWS.

It is expected that the California Supreme Court will be called upon to finally decide an unusual suit, recently tried, involving a $300,000 issue of bonds by the California Electric Light Company, of San Francisco. It appears that in 1888 the electric light company issued the bonds in question, giving each a face value of $1,000 and stipulating in the contract that they were to be payable 25 years from date, and to bear interest at the rate of six per cent per annum. A proviso was inserted that, on July 3, 1898, and on the same day of every subsequent year, the company would be privileged to take up 10 of the bonds, the ones to be thus taken up to be selected by lots drawn from a wheel. The company, however, prior to July 3, 1898, exchanged 196 of the bonds for others of a different denomination. Hence, when the first drawing of lots from the wheel took place, on July 3, only 104 numbers, representing the original bonds remaining, were used for the drawing. Two of the numbers drawn for payment represented the two bonds of Joseph Westall. He now contends that none of the 104 remaining bonds of the 1888 can be taken up, inasmuch as the provisions of the bonds providing for a lottery of 300 numbers can not be enforced, owing to the unauthorized taking up of 196 bonds prior to July 3, 1898. He refuses to surrender his holdings, and sues in Judge Kerrigan's court for his interest. It is understood that all of the other bondholders are behind Westall, and propose to fight the electric light company's attempt to take up its bonds before the same mature. In case the contention is successful the light company will lose about $12,000 in interest, which will have to be paid to the bondholders. It is said that there is no parallel to this case.

A contemporary asserts that the following reason for not subscribing to a technical paper was actually offered: "We are doing work we know how to do, and no one can tell us a better way; and we do not want to know any more about it than we do now."

A cable dispatch from Dublin, Ireland, states that it has been discovered that the temporary breakdown of one circuit of the city electric lighting system some nights ago was due to the misguided energy of an enterprising rat. The animal managed to get into one of the electric main pipes in Wicklow street. It gnawed through the insulating material that covered the wires through which the current was being conducted. In doing so it caused a commotion that few rats ever have had the distinction of bringing about, for it put out half the electric lamps in the city. But it paid for the distinction with its life. When the corporation officials went to the spot to repair the damage done, a charred mass was all that was left of the rat.

An effort is making in Juneau, Alaska, to organize a company to construct a telegraph line to Atlin City by way of the Taku trail. The estimated cost is $7,000, and the distance is about 100 miles, half water.

The electric cars of the city of Utrecht are now running straight across the middle of the venerable cathedral, according to a London paper. The statement seems incredible, but this is the explanation. Utrecht Cathedral was erected in the thirteenth century, and stands upon the site of the ancient mother church of the Trajectum ad Rhenum, founded by the English St. Willebrod, about the year 720. During the great storm of 1674 the roof of the gigantic nave fell in, and it was never rebuilt. For two centuries the choir at the east end and the magnificent tower at the west end, somewhere about 300 feet high, have continued detached, with a wide interval between the two. The practical Hollander turned the gap into the street, along which the lines of the electric railway are now laid.

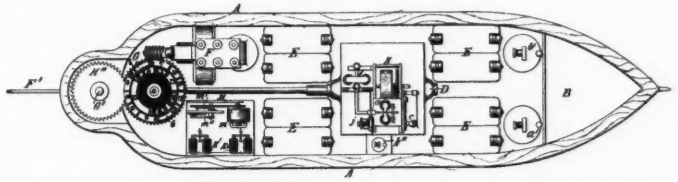


FIG. 1.—TESLA'S LATEST INVENTION—PLAN VIEW OF A VESSEL AND ITS CONTAINED MECHANISM.

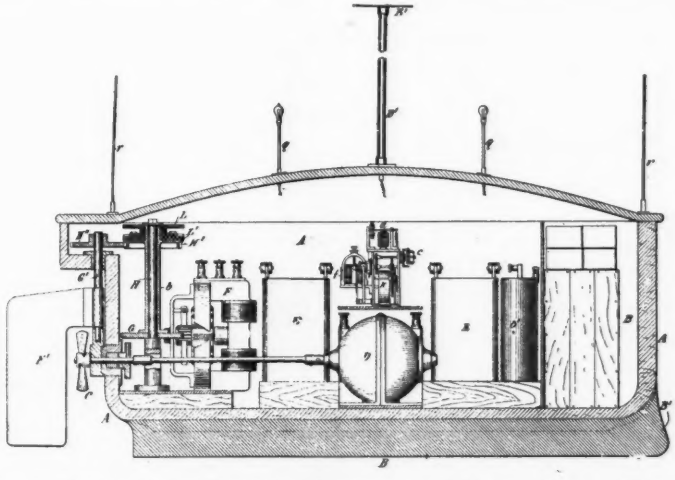


FIG. 2.—TESLA'S LATEST INVENTION—LONGITUDINAL SECTIONAL VIEW OF ELECTRICALLY CONTROLLED VESSEL AND ITS CONTAINED MECHANISM.

TESLA'S LATEST INVENTION.

DETAILS OF AN INVENTION WHICH MAY ASSURE THE PEACE OF THE WORLD.

The ELECTRICAL REVIEW last week began the publication of a patent just issued to Nikola Tesla for the invention of means and apparatus for controlling from a given point the operation of the propelling engines, the steering apparatus and other mechanism carried by a moving object, such as a boat, or any floating vessel, whereby the movements and courses of the body or vessel may be directed and controlled from a distance, and any device carried by the same brought into action at any desired time. After stating that the production of suitable waves or radiations, and the conveying of the same to a remote receiving apparatus capable of being operated or controlled by their influence, may be carried out in various ways which are at the present time more or less understood, the specification, which is presented herewith in full, goes on to describe the apparatus used as follows:

Still another way is to pass the currents simply through the ground by connecting both the terminals of the source of high frequency currents to earth at different and remote points and to utilize the currents spreading through the ground for affecting a receiving circuit properly placed and adjusted. Again, in this instance, if only one of the terminals of the receiving circuit be connected to the ground—the other terminal being insulated—the adjustment as to synchronism with the source will require that under otherwise equal conditions the length of wire be half of that which would be used if both the terminals be connected or, generally, if the circuit be in the form of a closed loop or coil. Obviously also, in the latter case, the relative position of the receiving and transmitting circuits is of importance, whereas, if the circuit be of the former kind, that is, open, the relative position of the circuits is, as a rule, of little or no consequence.

Finally, I may avail myself, in carrying out my invention of electrical oscillations which do not follow any particular conducting path, but propagate in straight lines through space of rays, waves, pulses or disturbances

of any kind, capable of bringing the mechanism of the moving body into action from a distance and at the will of the operator by their effect upon suitable controlling devices.

In the following detailed description I shall confine myself to an explanation of that method and apparatus only which I have found to be the most practical and effectual, but obviously my invention, in its broad features, is not limited to the special mode and appliances which I have devised and shall here describe.

In any event, that is to say, whichever of the above or similar plans I may adopt, and particularly when the influence exerted from a distance upon the receiving circuit be too small to directly and reliably affect and actuate the controlling apparatus, I employ auxiliary sensitive relays, or, generally speaking, means capable of being brought into action by the feeblest influences, in order to effect the control of the movements of the distant body with the least possible expenditure of energy and at the greatest practicable distance, thus extending the range and usefulness of my invention.

A great variety of electrical and other devices, more or less suitable for the purpose of detecting and utilizing feeble actions, are now well known to scientific men and artisans, and need not be all enumerated here.

Confining myself merely to the electrical as the most practicable of such means, and referring only to those which, while not the most sensitive, are, perhaps, more readily available, from the more general knowledge which exists regarding them, I may state that a contrivance may be used which has long been known and used as a lightning arrester, in connection with telephone switchboards for operating annunciators and like devices, and comprises a battery, the poles of which are connected to two conducting terminals separated by a minute thickness of dielectric. The electromotive force of the battery should be such as to strain the thin dielectric layer very nearly to the point of breaking down, in order to increase the sensitiveness. When an electrical disturbance reaches a circuit so arranged and adjusted, additional strain is put upon the insulating film, which gives way and allows the passage of a current which can be utilized to operate any form of circuit controlling apparatus.

Again, another contrivance capable of being utilized in detecting feeble electrical effects, consists of two conducting plates or terminals which have preferably wires of some length attached to them and are bridged by a mass of minute particles of metal or other conducting material. Normally, these particles, lying loose, do not connect the metal plates, but, under the influence of an electrical disturbance produced at a distance, evidently owing to electro-static attraction, they are pressed firmly against each other, thus establishing a good electrical connection between the two terminals. This change of state may be made use of in a number of ways for the above purpose.

Still another modified device, which may be said to embody the features of both the former, is obtained by connecting the two conducting plates or terminals, above referred to, permanently with the poles of a battery, which should be of very constant electro-motive force. In this arrangement a distant electrical disturbance produces a two-fold effect on the conducting particles and insulating films between them. The former are brought nearer to each other in consequence of the sudden increase of electro-static attraction, and the latter, owing to this as well as by being reduced in thickness or in number, are subjected to a much greater strain which they are unable to withstand.

It will be obviously noted from the preceding that, whichever of these or similar contrivances be used, the sensitiveness, and, what is often still more important, the reliability of operation is very materially increased by a close adjustment of the periods of vibration of the transmitting and receiving circuits, and, although such adjustment is in many cases unnecessary for the successful carrying out of my invention, I nevertheless make it a rule to bestow upon this feature the greatest possible care, not only because of the above mentioned advantages which are secured by the observance of the most favorable conditions in this respect, but also, and chiefly, with the object of preventing the receiving circuit from being affected by waves or disturbances emanating from sources not under the control of the operator. The narrower the range of vibrations, which are still capable of perceptibly affecting the receiving circuit, the safer will the latter be against extraneous disturbances. To secure the best result, it is necessary, as is well known to experts, to construct the receiving circuit, or that part of the same in which the vibration chiefly occurs, so that it will have the highest possible self-induction and at the same time the least possible resistance. In this manner I have demonstrated the practicability of providing a great number of such receiving circuits—50 or 100 or more—each of which may be called up or brought into action whenever desired, without the other being interfered with. This result makes it possible for one operator to direct, simultaneously, the movements of a number of bodies, as well as to control the action of a number of devices located on the same body, each of which may have a distinct duty to fulfill. In the following description, however, I shall show a still further development in this direction; namely, how, by making use of merely one receiving circuit, a great variety of devices may be actuated and any number of different functions performed at the will and command of the distant operator.

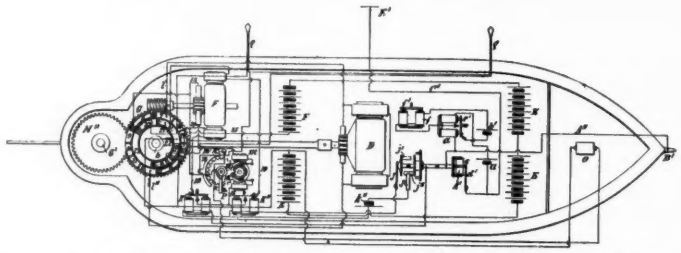
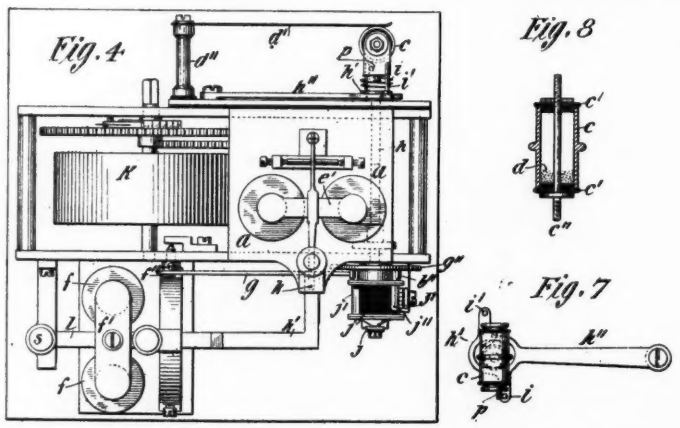


FIG. 3.—TESLA'S LATEST INVENTION—PLAN VIEW SHOWING ELECTRICAL CIRCUITS AND APPARATUS OF ELECTRICALLY CONTROLLED VESSEL.



FIGS. 4, 7 AND 8.—TESLA'S LATEST INVENTION.—DETAILS OF APPARATUS ON ELECTRICALLY CONTROLLED VESSEL.

It should be stated in advance, in regard to the sensitive devices above mentioned, which may be broadly considered as belonging to one class, inasmuch as the operation of all of them involves the breaking down of a minute thickness of highly strained dielectric, that it is necessary to make some provision for automatically restoring to the dielectric its original, unimpaired insulating qualities, in order to enable the device to be used in successive operations.

This is usually accomplished by a gentle tapping or vibration of the electrodes or particles, or continuous rotation of the same, but in long experience with many forms of these devices I have found that such procedures, while suitable in simple and comparatively unimportant operations, as ordinary signaling, when it is merely required that the succeeding effects produced in the receiving circuit should differ in regard to their relative duration only (in which case it is of little or no consequence if some of the individual effects be altered or incomplete or even entirely missed), do not yield satisfactory results in many instances, when it may be very important that the effects produced should all be exactly such as desired and that none should fail. To illustrate, let it be supposed that an official, directing the movements of a vessel in the manner described, should find it necessary to bring into action a special device on the latter, or to perform a particular operation, perhaps of vital moment, at an instant's notice, and possibly when, by design or accident, the vessel itself or any mark indicating its presence, is hidden from his view. In this instance a failure or defective action of any part of the apparatus might have disastrous consequences, and such cases, in which the sure and timely working of the machinery is of paramount importance, may often present themselves in practice, and this consideration has impressed me with the necessity of doing away with the defects in the present devices and procedures and of producing an apparatus which, while being sensitive, will also be most reliable and positive in its action. In the arrangement hereinafter described these defects are overcome in a most satisfactory manner, enabling thousands of successive operations, in all respects alike, being performed by the controlling apparatus without a single irregularity or miss being recorded. For a better understanding of these and other details of the invention as I now carry them out, I would refer to the accompanying drawings, in which

Fig. 1 is a plan view of a vessel and mechanism within the same.

Fig. 2 is a longitudinal section of the same showing the interior mechanism in side elevation.

Fig. 3 is a plan view, partially diagrammatical, of the vessel, apparatus and circuit connections of the same.

Fig. 4 is a plan view on an enlarged scale of a portion of the controlling mechanism.

Fig. 5 is an end view of the same.

Fig. 6 shows the same mechanism in side elevation.

Fig. 7 is a side view of a detail of the mechanism.

Fig. 8 is a central sectional view on a larger scale of a sensitive device forming part of the receiving circuit.

Fig. 9 is a diagrammatic illustration of the system in its preferred form.

Fig. 10 is a view of the various mechanisms employed, but on a larger scale and leaving out or indicating

conventionally certain parts of well understood character.

Referring to Fig. 1 and Fig. 2, A designates any type of vessel or vehicle which is capable of being propelled and directed, such as a boat, a balloon or a carriage. It may be designed to carry, in a suitable compartment B, objects of any kind, according to the nature of the uses to which it is to be applied. The vessel, in this instance a boat, is provided with suitable propelling machinery, which is shown as comprising a screw propeller C secured to the shaft of an electro-magnetic motor D, which derives its power from storage batteries E, E, E, E.

In addition to the propelling engine or motor, the boat carries also a smaller steering motor F, the shaft of which is extended beyond its bearings and provided with a worm which meshes with a toothed wheel G. This latter is fixed to a sleeve b, freely movable on a vertical rod H, and is rotated in one or the other direction, according to the direction of rotation of the motor F.

The sleeve b on rod H is in gear through the cog wheels H′ and H″ with a spindle G′ mounted in vertical bearings at the stem of the boat and carrying the rudder F′.

The apparatus, by means of which the operation of both the propelling and steering mechanisms is controlled, involves, primarily, a receiving circuit which, for reasons before stated, is preferably both adjusted and rendered sensitive to the influence of waves or impulses emanating from a remote source, the adjustment being so that the period of oscillation of the circuit is either the same as that of the source or a harmonic thereof.

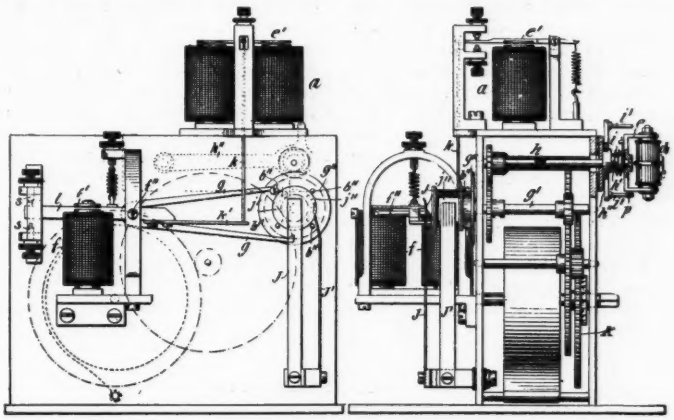
The receiving circuit proper, diagrammatically shown in Figs. 3 and 10, comprises a terminal E′, conductor C′, a sensitive device A′ and a conductor A″ leading to the ground, conveniently through a connection to the metal keel B′ of the vessel.

The terminal E′ should present a large conducting surface and should be supported as high as practicable on a standard D′, which is shown as broken in Fig. 2, but such provisions are not always necessary. It is important to insulate very well the conductor C′, in whatever manner it be supported.

The circuit or path just referred to forms also a part of a local circuit, which latter includes a relay magnet a and a battery a', the electro-motive force of which is, as before explained, so determined that although the dielectric layers in the sensitive device A′ are subjected to a great strain, yet normally they withstand the strain and no appreciable current flows through the local circuit. But when an electrical disturbance reaches the circuit, the dielectric films are broken down, the resistance of the device A′ is suddenly and greatly diminished and a current traverses the relay magnet a.

The particular sensitive device employed is shown in general views and in detail in Figs. 4, 6, 7 and 8. It consists of a metal cylinder c with insulating heads c', through which passes a central metallic rod c''. A small quantity of grains d of conducting material, such as an oxidized metal, is placed in the cylinder.

A metallic strip d', secured to an insulating post d'', bears against the side of the cylinder c, connecting it with the conductor C′, forming one part of the circuit. The central rod c'' is connected to the frame of the instrument and so to the other part of the circuit through the forked metal arm e, the ends of which are



FIGS. 5 AND 6.—TESLA'S LATEST INVENTION.—SIDE VIEW AND SIDE ELEVATION OF A PORTION OF THE CONTROLLING MECHANISM ON AN ELCTRICALLY CONTROLLED VESSEL.

fastened with two nuts to the projecting ends of the rod, by which means the cylinder c is supported.

In order to interrupt the flow of battery current, which is started through the action of the sensitive device A′, special means are provided, which are as follows: The armature e' of the magnet a, when attracted by the latter, closes a circuit containing a battery b' and magnet f. The armature lever f' of this magnet is fixed to a rock shaft f'', to which is secured an anchor escapement g, which controls the movements of a spindle g', driven by a clock train K.

The spindle g' has fixed to it a disk g'', with four pins b'', so that for each oscillation of the escapement g the spindle g' is turned through one-quarter of a revolution.

One of the spindles in the clock train, as h, is geared so as to make one-half of a revolution for each quarter revolution of spindle g'. The end of the former spindle extends through the side of the frame and carries an eccentric cylinder h', which passes through a slot in a lever h'', pivoted to the side of the frame

The forked arm e, which supports the cylinder c, is pivoted to the end of an eccentric h', and the eccentric and said arm are connected by a spiral spring l.

Two pins i'' i'' extend out from the lever h'', and one of these is always in the path of a projection on arm e. They operate to prevent the turning of cylinder c with the spindle h and the eccentric. It will be evident that a half revolution of the spindle h will wind up the spring i, and at the same time raise or lower the lever h'', and these parts are so arranged that just before the half revolution of the spindle is completed, the pin i'', in engagement with projection or stop pin p', is withdrawn from its path, and the cylinder c, obeying the force of the spring i, is suddenly turned end for end, its motion being checked by the other pin i''.

The adjustment relatively to armature f' of magnet f is furthermore so made that the pin i'' is withdrawn at the moment when the armature has nearly reached its extreme position in its approach towards the magnet, that is, when the lever l, which carries the armature f', almost touches the lower one of the two stops ss, Fig. 5, which limits its motion in both directions.

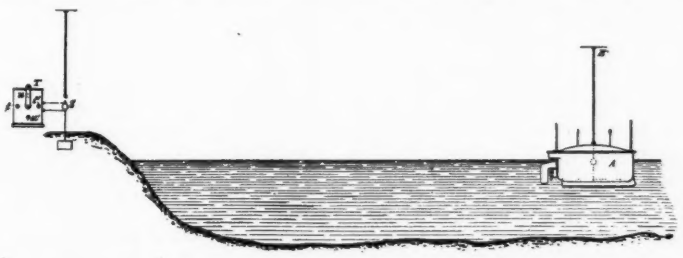


FIG. 9.—TESLA'S LATEST INVENTION.—DIAGRAM OF ELECTRICALLY CONTROLLED VESSEL SYSTEM.

The arrangement just described has been the result of long experimenting with the object of overcoming certain defects in devices of this kind, to which reference has been made before.

These defects I have found to be due to many causes, as the unequal size, weight and shape of the grains, the unequal pressure which results from this and from the manner in which the grains are usually agitated, the lack of uniformity in the conductivity of the surface of the particles, owing to the varying thickness of the superficial oxidized layer, the varying condition of the gas or atmosphere in which the particles are immersed and to certain deficiencies, well known to experts, of the transmitting apparatus as heretofore employed, which are in a large measure reduced by the use of my improved high-frequency coils. To do away with the defects in the sensitive device, I prepare the particles so that they will be in all respects as nearly alike as possible. They are manufactured by a special tool insuring their equality in size, weight and shape, and are then uniformly oxidized by placing them for a given time in an acid solution of predetermined strength. This secures equal conductivity of their surfaces and stops their further deterioration, thus preventing a change in the character of the gas in the space in which they are enclosed. I prefer not to rarefy the atmosphere within the sensitive device, as this has the effect of rendering the former less constant in regard to its dielectric properties, but merely secure an air-tight enclosure of the particles and rigorous absence of moisture, which is fatal to satisfactory working.

The normal position of the cylinder c is vertical, and when turned in the manner described, the grains in it are simply shifted from one end to the other. But inasmuch as they always fall through the same space and are subjected to the same agitation, they are brought, after each operation of the relay, to precisely the same electrical condition, and offer the same resistance to the flow of the battery current until another impulse from afar reaches the receiving circuit.

The relay magnet a should be of such character as to respond to a very weak current and yet be positive in its action. To insure the retraction of its armature e', after the current has been established through the magnet f and interrupted by the inversion of the sensitive device c, a light rod k is supported in guides on the frame in position to be lifted by an extension k' of the armature lever l and to raise slightly the armature e'. As a feeble current may normally flow through the sensitive device and the relay magnet a, which would be sufficient to hold, though not draw, the armature down, it is well to observe this precaution.

The operation of the relay magnet a and the consequent operation of electro-magnet f, as above described, are utilized to control the operation of the propelling engine and the steering apparatus in the following manner:

On the spindle g', which carries the escapement disk g'', Fig. 4 and Fig. 6, is a cylinder j, of insulating material with a conducting plate or head at each end. From these two heads respectively contact plates or segments j' j'' extend on diametrically opposite sides of the cylinder. The plate j'' is in electrical connection

with the frame of the instrument through the head from which it extends, while insulated strips or brushes J J′ bear upon the free end or head of the cylinder and the periphery of the same respectively. Three terminals are thus provided, one always in connection with plate j', the other always in connection with the plate j'', and the third adapted to rest on the strips j' and j'' in succession or upon the intermediate insulating spaces, according to the position in which the commutator is brought by the clock train and the anchor escapement g.

K′ K″, Figs. 1, 3 and 10, are two relay magnets, conveniently placed in the rear of the propelling engine. One terminal of a battery k'' is connected to one end of each of the relay coils; the opposite terminal to the brush J′, and the opposite ends of the relay coils to the brush J, and to the frame of the instrument respectively. As a consequence of this arrangement either the relay K′ or K″ will be energized, as the brush J′ bears upon the plate j' or j'' respectively, or both relays will be inactive while the brush J′ bears upon an insulating space between the plates j' and j''.

While one relay, as K′, is energized, its armature closes a circuit through the motor F, which is rotated in a direction to throw the rudder to port. On the other hand, when relay K″ is active, another circuit through the motor F is closed, which reverses its direction of rotation and shifts the rudder to starboard. These circuits, however, are at the same time utilized for other purposes, and their course is, in part, through apparatus which I shall describe before tracing their course.

The fixed rod H carries an insulating disk or head L, Fig. 2, to the under line of which are secured six brushes, 1, 2, 3, 4, 5 and 6, Fig. 3. The sleeve b, which surrounds the rod and is turned by the steering motor F, carries a disk L′, upon the upper face of which are two concentric circles of conducting contact plates Brushes 1, 2, 3 and 4 bear upon the inner circle of contacts, while the brushes 5 and 6 bear upon the outer circle of contacts.

The outer circle of contacts comprises two long plates, 7 and 8, on opposite sides of the disk, and a series of shorter plates, 9, 10, 11, 12, 13 and 14, in the front and rear. Flexible conductors l l' connect the plates 7 and 8 with the terminals of the propelling motor D, and the poles of the main battery E are connected to the brushes 5 and 6 respectively, so that, while the rudder is straight or turned up to a certain angle to either side, the current is conveyed through the brushes 5 and 6 and segments 7 and 8 to the propelling motor D.

The steering motor F is also driven by current taken from the main battery E in the following manner. A conductor 15, from one pole of the battery, leads to one of the commutator brushes, and from the other brush runs a conductor 16 to one of the contacts of each relay K′ K″. When one of these relays, as K″, is active, it continues this circuit through a wire 19, through one field-coil or set of field coils on the motor F, and thence to the brush l. In a similar manner, when the other relay K′ is active, the circuit is continued from wire 18, through a wire 20, the second or reversing set of field-coils, and to brush 2.

Both brushes 1 and 2, at all times when the rudder is not turned more than about 45 degrees to one side, are in contact with a long-conducting plate 21, and one brush, in any position of the rudder, is always in contact with said plate, and the latter is connected by a flexible conductor 22 with the opposite pole of the main battery. Hence the motor F may always be caused to rotate in one direction, whatever may be the position of the rudder, and may be caused to rotate in either direction whenever the position of the rudder is less than a predetermined angle, conveniently forty-five degrees from the center position.

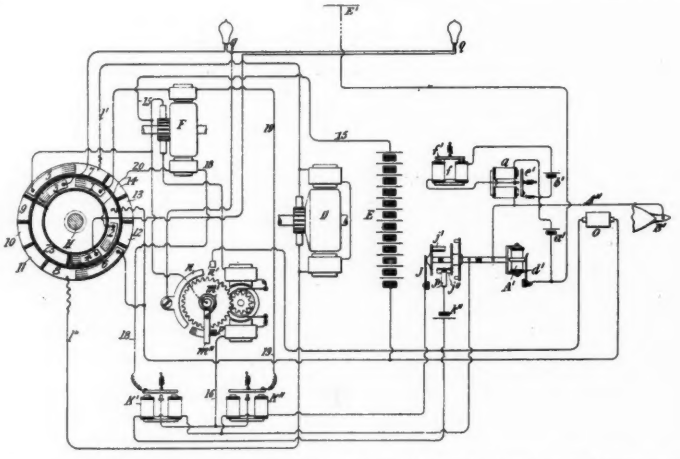


FIG. 10.—TESLA'S LATEST INVENTION—VIEW OF VARIOUS MECHANISMS EMPLOYED ON ELECTRICALLY CONTROLLED VESSEL.

In order, however, to prevent the rudder from being turned too far in either direction, the isolated plate 23 is used. Any movement of the rudder beyond a predetermined limit brings this plate under one or the other of the brushes 1, 2, and breaks the circuit of motor F, so that the rudder can be driven no further in that direction, but, as will be understood, the apparatus is in condition to turn the rudder over to the other side.

In like manner the circuit of the propelling motor D is controlled through brushes 5 and 6 and the segments on the outer circle of contacts of head L If the short segments on either side of the circle are insulated, the motor D will be stopped whenever one of the brushes 5 or 6 passes onto one of them from the larger segments 7, 8.

It is important to add that on all contact points where a break occurs, provision should be made to overcome the sparking and prevent the oscillation of electrical charges in the circuits, as such sparks and oscillations may affect the sensitive device. It is this consideration chiefly which makes it advisable to use the two relays K′ K″, which otherwise might be dispensed with. They should be also placed as far as practicable from the sensitive device in order to guard the latter against any action of strong varying currents.

In addition to the mechanism described the vessel may carry any other device or apparatus as might be required for accomplishing any special object of more or less importance. By way of illustration, a small motor m is shown (Figs. 1 and 3), which conveniently serves for a number of purposes. This motor is shown connected in series with the armature of the steering motor F, so that, whenever either one of the circuits of the latter is closed through relays K′ K″, the motor m is likewise rotated, but in all cases in the same direction. Its rotation is opposed by a spring m', so that, in normal operation, owing to the fact that the circuits of motor F are closed but a short time, the lever m'' which is fastened to one of the wheels of clockwork M, with which the armature of the motor is geared, will move but a short distance, and upon cessation of the current return to a stop P. But if the circuits of the motor F are closed and opened rapidly in succession, which operation leaves the rudder unaffected, then the lever m'' is moved to a greater angle, coming in contact with a metal plate n, and finally, if desired, with a post n'.

Upon the lever m'' coming in contact with plate n, the current of the main battery passes either through one or other or both of the lights supported on standards q q, according to the position of brushes 3 and 4 relatively to the insulating segment 23. But since the head L carrying the segments is geared to the rudder, the position of the latter is in a general way determined by observing the lights. Both of the lights may be colored, and by flashing them up whenever desired the operator may guide at night the vessel in its course. For such purposes also the standards r r are provided, which should be painted in lively colors, so as to be visible at great distances.

By opening and closing the circuits of motor F a greater number of times, preferably determined beforehand, the lever m'' is brought in contact with post n', thus closing the circuit of the main battery through a device o and bringing the latter into action at the moment desired. By similar contrivances, or such as will readily suggest themselves to mechanicians, any number of different devices may be operated.

Referring now to Fig. 9, which illustrates diagrammatically the system as practiced when directing the movements of a boat:

In this figure S designates any source of electrical disturbance or oscillations, the generation of which is controlled by a suitable switch contained in box T. The handle of the switch is movable in one direction only, and stops on four points, t, t', u, u', so that, as the handle passes from stop to stop, oscillations are produced by the source during a very short time interval. There are thus produced four disturbances during one revolution, and the receiving circuit is affected four times; but it will be understood from the foregoing description of the controlling devices on the vessel that the rudder will be moved twice, once to right and once to left. Now I preferably place the handle of the switch so that, when it is arrested on points t, t'—that is, to the right or left of the operator—he is reminded that the vessel is being deflected to the right or left from its course, by which means the control is facilitated. The normal positions of the handle are therefore at u, u' when the rudder is not acted upon, and it remains on the points t, t' only so long as necessary. Since, as before stated, the working of the apparatus is very sure, the operator is enabled to perform any such operations as provision is made for without even seeing the vessel.

The manner of using the apparatus and the operation of the several instrumentalities comprising the same is, in detail, as follows: Normally, the plate L′ is turned so that brush 2 rests upon the insulated segment 23, and brush 6 upon one of the isolated short segments in the rear of the circle. Under these conditions the rudder will be turned to starboard and the circuit of motor D interrupted between brushes 5 and 6. At the same time, only one of the circuits of motor F—that controlled by relay K′—is capable of being closed, since brush 2, which connects with the other, is out of contact with the long segment 21.

Assuming now that it is desired to start the vessel and direct it to a given point. The handle T is turned from its normal position on u' to the point t on the switch-box. This sends out an electrical disturbance which, passing through the receiving circuit on the vessel, affects the sensitive device A′ and starts the flow of current through the local circuit, including said device, the relay a and the battery a'. This, as has been previously explained, turns the cylinder j and causes the brush J′ to pass from insulation onto the contact j'.

(Concluded on page 312.)

The Ventilation of Underground Electric Railways.

[*From the London Standard.*]

Considerable attention has been attracted to the caution recently given in the columns of the *Lancet*—apropos a slight breakdown on the City & Waterloo Railway—as to the dangers likely to arise on railways constructed on the tubular system from lack of ventilation. There does not seem to be any question as to the provision of an ample supply of air while the trains are running. Obviously, they themselves create a current which would be more than sufficient for all purposes, especially as there is no consumption of oxygen by the engines themselves. The medical warning was directed to cases where, from one cause or another, a train was stopped between stations and the circulation of air due to the passage of the trains ceased. The principle of construction of these electrical railways is in all cases the same, both lines being carried in separate tunnels, which are really gigantic tubes in which the carriages practically fill all the space. The longest line on this system is the Central Railway, which is now in course of construction, and of this Sir Benjamin Baker is the designer. It is six miles long, and the stations are about half a mile apart. Sir Benjamin stated to a representative of the *Standard* that the caution of the *Lancet* was quite unnecessary, no such risks as was foreshadowed by that paper being likely to arise. Though dealing with the Central London Railway, his remarks hold good of all this type of railway. In the particular case, however, there are at each station vertical shafts from 20 feet to 30 feet in diameter, with electrical lifts moving up and down every two minutes. These act—and are designed so to act—like enormous pumps, sucking up and restoring the air in the tunnels. Even without these he points out that the cubic feet of air in any given length of tunnel would amount to at least 20 times the quantity per individual that would be provided or necessary in a hospital, or any other building where attention is given to sanitary requirements. In addition to the lifts there are at each station stairway shafts, 18 feet in diameter, which also act as permanent ventilators. Of course, just as in an omnibus or an ordinary railway carriage, a compartment may become stuffy, and feel close, if the windows are not opened, but that will be the fault of the passengers themselves or of incompetent guards.

ELECTRIC RAILWAY NOTES.

The capital stock of the Third Avenue Railway Company, of New York city, has been increased from $10,000,000 to $12,000,000.

William B. Royce, of Middletown, N. Y., has been appointed receiver of the Middletown–Goshen Traction Company, which runs an electric street surface railroad from Middletown to Goshen.

New York and Philadelphia capitalists will, it is said, build an electric freight line between East Liverpool and Lisbon, Ohio. They have options on 18,000 acres of the best coal lands in the state. The deal represents $700,000 investment.

The Third Avenue Railroad Company, of New York city, has begun the work of changing its motive power from cable to electricity on its Third avenue line, and will immediately put 6,000 men to work.

The report of the Cohoes, N. Y., City Railway for the quarter ended September 30 shows: Gross earnings, $8,241.33; operating expenses, $6,769.86; net earnings, $1,471.47; fixed charges, $1,662; deficit, $190.53, as compared with a deficit of $864.43 for the same quarter of last year.

At the annual meeting of the stockholders of the Fall River & Providence, R. I., Street Railway Company the following directors were elected: Frank W. Brightman, George W. Slade, Robert S. Goff, Fall River; P. L. Saltonstall, Milton; W. A. Tucker, Boston. The directors did not organize.

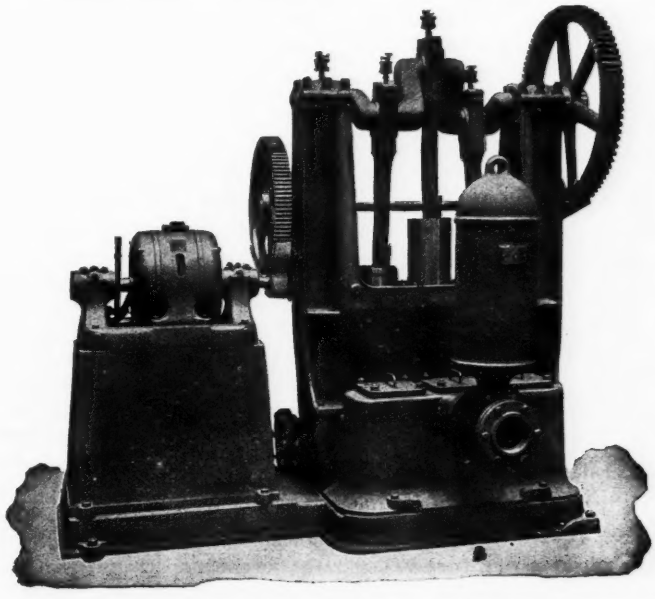
The report of the Amsterdam, N. Y., Street Railroad Company for the quarter ended September 30 shows: Gross earnings, $12,490.43; operating expenses, $7,703.43; net earnings, $4.787; fixed charges, $3,659.79; net income, $1,127.21, as compared with a net income of $210.84 for the corresponding quarter of last year.

The Montreal Street Railway reports for the year ended September 30 a surplus after operating expenses and fixed charges of $601,704, against $507,856 last year. The company is paying dividends at the rate of about nine per cent of its capital stock. The earnings last year were equivalent to about 14 per cent.

At the annual meeting of the Dartmouth & Westport, Mass., Street Railway Company the following directors were elected for the ensuing year: Henry H. Crapo, Oliver Prescott, Jr., E. S. Brown. J. A. Beauvais and Charles E. Cook, New Bedford; Robert S. Goff, F. W. Brightman, W. L. Winslow and B. D. Davel, Fall River.

The report of the Herkimer, Mohawk, Ilion & Frankfort, N. Y., Electric Railway Company for the quarter ended September 30 shows gross earnings, $10,833.35; operating expenses, $5,229.75; gross income, $5,603.60; fixed charges, $2,175; net income, $3,428, as compared with a net income for last year of $3,428.60.

The People's Telephone Company contemplates the erection of a three-story fireproof exchange at Knoxville, Tenn, and will put all its wires under ground.



Direct-Connected Triplex Electric Pump.

Capital Invested in British Telephone and Telegraph Companies.

The "Manual of Electrical Undertakings," for 1898, published in London, Eng., supplies a number of interesting figures showing the amount of capital embarked in telegraphic and telephonic companies conducted from, or having business relations with, that city.

Of the telegraph companies, which include such widely separated undertakings as the African Trans-Continental Company and the Cuba Submarine Company, the ordinary and deferred capital amounts to £20,680,699, distributed over 28 concerns. The preferential capital is returned at £6,359,670 and the loan and debenture capital at £4,942,989, making the total sum involved £31,983,365, as against a total of £31,103,254 in 1896. The average rates of dividend paid in 1897 were 5.49 per cent on the ordinary, 6 06 per cent on the preference, 4.41 per cent on the loan and debenture, and 0.04 per cent on the deferred capital. The average return upon the whole capital employed was 4.84 per cent, comparing with 4.39 per cent in 1896.

The telephone companies dealt with in the "Manual" employ the following sums: Ordinary capital, £3,731,309; preference capital, £1,775,855; loan and debenture, £1,652,204, or a total of £7,159,368, distributed over 12 undertakings. The average rate of interest paid in 1897 on the ordinary capital was five per cent, on the preference 5.13 per cent, and on the loan and debenture 3.87 per cent. The average rate on the whole capital of all denominations was 5.77 per cent, comparing with 4 66 per cent in 1896.

A Direct-Connected Triplex Electric Pump.

A triplex pump for light service, to be used with or without an automatic controller and manufactured by the Goulds Manufacturing Company, of Seneca Falls, N. Y., is shown in the accompanying illustration. It is arranged with a motor base and is geared to be driven by a motor forming a complete, compact and self-contained equipment for pumping to elevators of 100 feet, equivalent to 43 pounds pressure. The motor base permanently maintains the correct relative position of pump and motor and is an adequate foundation. The motor is placed at the side or one end of the pump, as most convenient. The gearing is machine cut. The gears are of iron and pinions of steel, bronze or rawhide, as is best for the contemplated service.

Electrical Review

OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.]

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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue. NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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It is announced that the New York Central & Hudson River Railroad will run its trains from Mott Haven to the Grand Central Station, in New York city, by electricity. Aside from other known advantages of electric over steam traction, the absence of cinders, dust and steam will be highly appreciated by the traveling public.

LAKE COPPER, 13 CENTS.

Lake copper reached a price of 13 cents a pound in the New York metal market on Saturday last. This is an advance of one cent within a month and is the highest price recorded for a long time. The advance has created a lively demand for the shares of the principal copper mining companies, which have recently reached top prices.

The principal influence which has created the unusual demand for copper, resulting naturally in an appreciable rise in copper stocks, has been the call from Europe for the metal for electric railway purposes. In Germany, France and England the electric street railway business is in a rapidly growing condition, and in the United States numerous new enterprises and extensions of existing systems have required very large quantities of copper. This is notably true in New York city, where the Metropolitan Street Railway Company and the Third Avenue Railroad Company are changing their lines from cable to electric traction. The Third avenue road alone will need $1,500,000 worth of feeder cable and the Metropolitan company at least as much. Then, too, the United States Government bought during the war practically all the torpedo cable our many wire manufacturers could turn out for periods varying from 60 to 90 days, with the factories working overtime, in some instances continuously.

A high price for copper is a good sign in the electrical business. It means that there is a real demand for a metal which enters to a greater or less degree into every piece of electrical apparatus manufactured, except insulators. Therefore, when the manufacturers of electrical apparatus, insulated wire and cables need copper to such an extent as to cause a record price for the metal, it indicates that the supply houses and manufacturers' agents are finding a ready sale for their wares. In a word, the price of copper may be taken generally as a barometer of the state of the electrical industry. We think the signs at present prophesy that the next year will be an unusually active and profitable one in the electrical field.

TESLA'S PEACE MANIFESTO.

We conclude in this issue the full text of the specifications of the patent issued to Nikola Tesla last week, and which excited such unusually widespread interest, more especially in military circles. Although Tesla contemplates in the description of his marvelous invention chiefly its uses in peace, its tremendous importance in regard to its powers in warfare did not escape the keen perceptions of our alert army and navy officials.

We think that the numerous press comments did not really bring out with sufficient clearness the revolutionary features of the invention, particularly in regard to the furtherance of the noble cause which the Czar of Russia voices in his stirring peace manifesto. Naturally our heroes are keenly disappointed at the prospect of having no wars, but the every-day citizen will hail with joy the success of Tesla's humane efforts.

The ability to control with precision, from a distance of a score of miles the movements of a vessel with no soul on board—to call any of its numerous appliances into play, at any desired moment—would of itself be a stupendous achievement. But when this vessel in addition has the power of distinguishing with almost human intelligence the orders which it receives from afar, though silent and invisible—obeying only those for which the builder designed it, and remaining unresponsive to all others—the imagination staggers when following the immediate consequences of such an unheard-of result. Inventions of a startling character have been made before, but most of them have been the result of gradual development. Here the inventor has given us an entirely new and wonderful art. There is something appalling, awe-inspiring in Tesla's invention.

The city of Havana must be cleansed of the accumulated filth of four centuries before it will be safe for Americans to venture to make it a permanent abiding place. The yellow fever finds there an ideal breeding ground, now that General Wood has reformed the sanitary condition of Santiago, until recently known as one of, if not the worst, yellow fever strongholds in the world. The effort to cleanse Havana has already cost the life of Colonel Waring. Numerous others of our government officials who have been obliged to go there, the last being Colonel Williams, have succumbed to the dread disease. We understand that Colonel Waring's report on the long needed sanitary reform of Havana was practically complete at the time of his death. President McKinley has, we are told, appointed Mr. William J. Clark, general manager of the General Electric Company's railway department, to carry out Colonel Waring's work in practical form. The appointment is an excellent one; for, besides having had a great deal of experience in Cuba, Mr. Clark possesses executive ability of a high order and that subtle "know how" which is acquired only by years of training in the emergency work incident to the electrical business. If Mr. Clark is not hampered by red tape, it is pretty certain that Havana will be made clean and healthful in the shortest possible time.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The elections are over and the results of a sound-money victory and the indorsement of the administration's war policy were instantly reflected in the stock market. Although the New York Stock Exchange only did business for four and a half days during the past week, the stock dealings amounted to upward of 1,000,000 shares more than during the previous full week. The number of issues dealt in was 199, never having been greater since the exchange opened. In the bond market 225 issues were dealt in, aggregating nearly $33,500,000 par value, or nearly twice the amount dealt in during the previous week. Legitimate enterprises now have a clear field ahead for rapid and profitable development. The London market is especially favorable to American securities, which always acts as a fresh incentive to buying here. A period of good times is unmistakably indicated by present commercial and financial conditions.

Application has been made to the New York Stock Exchange to list $17,000,000 common and $3,000,000 preferred stock of the United Traction Company, of Pittsburgh.

On the New York exchange General Electric closed at 82¾ bid and 83 asked. Western Union closed at 93¾ bid and 94 asked. On the Boston exchange American Bell Telephone closed at 280 bid and no asking price. Erie Telephone closed at 74½ bid and 75 asked. On the Philadelphia exchange Electric Storage Battery common closed at 47½ bid and 47¾ asked. The preferred closed at 56 bid and 56½ asked. A steady and warranted rise is predicted for this stock. The company is doing a splendid business, and its present management, it is said, holds the largest stock interest.

Wall street, November 12

Telephone News .....and Comment

The telephone exchange at Tuskegee, Ala., was recently destroyed by fire.

The New York Telephone Company is extending its subway system in Yonkers, N. Y.

At Elyria, Ohio, the local Bell company is making a residence rate for telephones of 50 cents a month. The independent company has been asking $1 a month. No cut has yet been made on the business rate.

The New York Telephone Company placed in service last Sunday the new common battery return system recently installed in its Harlem exchange in 124th street, near Lexington avenue, New York city.

A suit to test the rates charged by the Central Union Telephone Company has been filed at Richmond, Ind. It is entitled the state of Indiana *ex rel.* Samuel C. Whitesell. The plaintiff tendered the company $7.50 for three months' rent of an office telephone, which was refused, the rate being $10.50. The suit is to compel the company to furnish the telephone at the reduced rate or else appear in court and show reason.

The Empire State Telephone Company has abandoned several of its lines in Ontario and Yates counties, N. Y., taking out the instruments from a number of offices and cutting the wires. The offices to be closed are: Bristol, Bristol Center, East Bloomfield, West Bloomfield, Bristol Springs, Naples, Honeoye, Reed's Corners, Rushville, Iona, Middlesex and Vine Valley. The company has taken this step to avoid litigation with the farmers upon whose lands the poles have been placed, and who, it is said, have been instigated to bring suit by Arthur E. Clark, a Batavia lawyer.

The Kentucky Telephone Association was recently organized at Crab Orchard, Ky., with the following officers: A. H. Bastin, president, Crab Orchard; J. S. Vanwinkle, Danville; E. T. Fish, Berea, and A. D. Shotwell, Somerset, vice-presidents; James Maret, secretary, Mt. Vernon; F. P. Cambest, treasurer. The object of the association is the improvement and extension of the independent telephone service in Kentucky, and for the mutual benefit and protection of its members. Nearly all Kentucky companies were represented at the meeting, and it is promised that a great improvement and many extensions will be had at an early date.

Attorney-General Monnett, of Ohio, will, it is said, again take up his fight against the Central Union Telephone Company to compel them to place their instruments in use about the state on the tax duplicate at a higher valuation. The matter is one of importance, and if decided favorably to the state will increase the general tax duplicate about $700,000. The claim is made by the state that the instruments are now placed on the tax duplicate at their value simply as a piece of property, independent of any connection with the wire or the telephone exchange, and that instead they should be taxed at their earning capacity. This would increase their value many fold.

Four great telephone and telegraph systems, covering practically the entire west coast with their ramifications, will henceforth be known under the general and comprehensive designation of the Pacific States Telephone Company. These companies are the Oregon Telephone and Telegraph Company, with lines covering the greater part of Oregon; the Inland Telephone and Telegraph Company, taking in Eastern Oregon and Washington; the Pacific Telephone and Telegraph Company, comprising the lines in the city and county of San Francisco; the Sunset Telephone and Telegraph Company, whose lines cover nearly all of California, the lower part of Oregon and eastern Washington. These four companies are under practically the same ownership and have the same officers and boards of directors, so far as the state laws under which they operate will permit. With a wire extending from Portland to San Diego, the Pacific States Telephone Company has one of the longest lines in the world.

The election returns were quite generally given Tuesday evening to telephone subscribers. The two companies that furnish service in Greater New York—the New York Telephone Company and the New York & New Jersey Telephone Company—arranged to give the news to all subscribers who asked for it. With the aid of the far reaching service of the American Telephone and Telegraph Company, the news from great distances was promptly given. As on other occasions the work of the New York company was greatly appreciated, and subscribers were quickly given the news which was greedily asked for. The New York & New Jersey company's excellent service was particularly appreciated in Brooklyn and New Jersey. Vice-president W. D. Sargent invited a number of friends to his handsome new offices in Willoughby street, Brooklyn, and in addition to supplying election news provided a very enjoyable repast, aided by his staff, including general superintendent J. C. Reilly, treasurer Henry Sanger Snow and secretary Joel C. Clark.

Electricity in the Soldering of Metals.

The process of the electric soldering of metals, especially applicable to iron and steel, which has lately been patented by a German manufacturer, differs sensibly from the well known process of Lagrange and Hoho. This latter process has been tried in vain, in order to effect the proper soldering of iron. The pieces soldered separated as soon as they were called to support a strain of any importance. The fault lay in a wrong use of the current, the interior core of the metal not attaining the temperature necessary to proper soldering. Hence the edges only are soldered, while the central parts undergo an imperfect sizing that has no solidity in it. For two metallic masses to be properly soldered together, a reciprocal penetration of the molecules of the two bodies is necessary, both adhering firmly and compactly together. This is the only means of having a junction of the two pieces that will offer the same resistance as a single piece. This reciprocal penetration of the two masses prevents, moreover, the formation of flaws and cracks in the place that has been soldered. The new process, as indicated by the documents lodged with the bureau of patents at Goerlitz, consists in first heating the metallic parts to be joined together in a furnace (gas or any other system) to the necessary soldering temperature. The pieces are then placed in the electrolytic bath, as used by Lagrange and Hoho, and then submitted to compression in a powerful press. The pieces to be soldered are withdrawn in the bath from the negative pole of an electric source, the currents being allowed but a short time to act on the metal, which soon becomes of a soldering whiteness. It is at this stage that the pieces are submitted to the press when a complete adhesion of the two bodies results. This process is thoroughly logical, and is, moreover, economical in cost, since the current is used only during the time it is strictly necessary to employ it in soldering the metals, and not as is customary in heating the two masses.—*Elektrochemische Zeitschrift.*

Making White Lead by Electricity.

To the Editor of Electrical Review:

Referring to your publication of a notice on "The Manufacture of White Lead by Means of Electricity" in your issue of November 2, page 280, I beg to call your attention to the fact that a process has been patented lately in the United States which produces a white lead of superior quality by means of electricity. A small plant is now in operation in Brooklyn by which between five and six pounds of white lead are produced per hour. The process employs a solution of ammonium nitrate and bicarbonate, and produces two pounds of white lead per electrical horse-power hour. The product is perfectly white, and has a body and covering capacity equal to the best quality in the market. The process is continuous, and requires no interruptions for the removal of the product. The cost of operation depends exclusively on the cost of electrical energy, the electrolyte being continuously regenerated. This process has the advantage as against the process mentioned in your paper that the ammonium salts used prevent the formation of plumbites and plumbates, which, on being reduced on the cathodes to spongy metallic lead, waste electrical energy, besides spoiling the product.

L. P. C.

New York, November 10.

PERSONAL.

Mr. L. G. Bowman, of the Stromberg-Carlson Telephone Manufacturing Company, Chicago, was a New York visitor last week.

President Clinton L. Rossiter, of the Brooklyn Heights Railroad Company, took a party of friends in a special car on election night through the news centers in Brooklyn and over the Bridge to Park Row. The vast throngs, the excitement and noise of the night were witnessed and heard to great advantage. It was a very interesting trolley ride.

The arc lamp industry of the United States is one of the solid and important branches of the electrical business. Within the last few years there has been quite a noticeable change from the old-style open arc to the enclosed arc, and to day it is estimated that from 75,000 to 100,000 enclosed arc lamps are in use. The demand for this style of arc lamp is constantly increasing, and it is very rapidly replacing the former make.

TESLA'S LATEST INVENTION.

(Concluded from page 308.)

The battery k'' is thus closed through relay K'', and the latter closes that circuit of the motor F which, starting from plate 22, which is permanently connected with one pole of the main battery, is completed through the brush 1, the field of motor F, wire 19, the armature of relay K'', wire 16, the motor m, the brushes and commutator of motor F, and wire 15 to the opposite terminal of the battery E. Motor F is thus set in operation to shift the rudder to port, but the movement of plate L', which follows, brings the brush 6 back onto segment 8 and closes the circuit of the propelling motor, which starts the vessel.

The motor F is permitted to run until the rudder has been turned sufficiently to steer the vessel in the desired direction, when the handle T is turned to the point u. This produces another action of the relay a, and brush J' is shifted onto insulation and both relays K' and K'' are inactive.

The rudder remains in the position to which it has been shifted by the motor F. If it be then desired to shift it to starboard or in the opposite direction to that in which it was last moved, the handle T is simply turned to point t' and allowed to remain there until the motor F, which is now operated by relay K', the circuit of which is closed by strip J' coming into contact with plate j'', has done its work.

The movement of handle T to the next point throws out both relays K' and K'', and the next movement causes a shifting of the rudder to port, and so on. Suppose, however, that after the rudder has been set at any angle to its middle position, it be desired to shift it still further in the same direction. In such case, the handle is moved quickly over two points, so that the circuit which would move the rudder in the opposite direction is closed for too short a time interval to produce an appreciable effect, and is allowed to rest on the third point until the rudder is shifted to the desired position, when the handle is moved to the next point, which again throws out both relays K' and K''. It will be understood that, if the handle be held for a sufficiently long time upon either point t or t', the motor will simply turn the plate L' in one direction or the other until the circuits of motors D and F are broken. It is furthermore evident that one relay K' or K'' will always be operative to start the motor F.

As previously explained the longest period of operation of which the motor F is capable, under ordinary conditions of use, does not permit the motor m to shift the arm m' into contact with the plate n. But if the handle T be turned with a certain rapidity a series of current impulses will be directed through motor m, but, as these tend to rotate the motor F in opposite directions, they do not sensibly affect the latter, but act to rotate the motor m against the force of the coiled spring.

The invention which I have described will prove useful in many ways. Vessels or vehicles of any suitable kind may be used as life, despatch or pilot boats or the like or for carrying letters, packages, provisions, instruments, objects or materials of any description, for establishing communication with inaccessible regions and exploring the conditions existing in the same, for killing or capturing whales or other animals of the sea, and for many other scientific, engineering or commercial purposes. But the greatest value of my invention will result from its effect upon warfare and armaments, for, by reason of its certain and unlimited destructiveness, it will tend to bring about and maintain permanent peace among nations.

Having now described my invention, what I claim is:

1. The improvement in the art of controlling the movements and operation of a vessel or vehicle herein described, which consists in producing waves or disturbances which are conveyed to the vessel by the natural media, actuating thereby suitable apparatus on the vessel and effecting the control of the propelling engine, the steering and other mechanism by the operation of the said apparatus, as set forth.

2. The improvement in the art of controlling the movements and operation of a vessel or vehicle, herein described, which consists in establishing a region of waves or disturbances, and, actuating by their influence exerted at a distance, the devices on such vessel or vehicle, which control the propelling, steering and other mechanism thereon, as set forth.

3. The improvement in the art of controlling the movements and operation of a vessel or vehicle, herein described, which consists in establishing a region of electrical waves or disturbances, and, actuating by their influence exerted at a distance, the devices on said vessel or vehicle, which control the propelling, steering and other mechanism thereon, as set forth.

4. The improvement in the art of controlling the movements and operation of a vessel or vehicle, herein described, which consists in providing on the vessel a circuit controlling the propelling, steering and other mechanism, adjusting or rendering such circuit sensitive to waves or disturbances of a definite character, establishing a region of such waves or disturbances, and rendering by their means the controlling circuit active or inactive, as set forth.

5. The combination with a source of electrical waves or disturbances of a moving vessel or vehicle, and mechanism thereon for propelling, steering or operating the same, and a controlling apparatus adapted to be actuated by the influence of the said waves or disturbances at a distance from the source, as set forth.

6. The combination with a source of electrical waves or disturbances of a moving vessel or vehicle, mechanism for propelling, steering or operating the same, a circuit and means therein for controlling said mechanism, and means for rendering said circuit active or inactive through the influence of the said waves or disturbances exerted at a distance from the source, as set forth.

7. The combination with a source of electrical waves or disturbances and means for starting and stopping the same, of a vessel or vehicle, propelling and steering mechanism carried thereby, a circuit containing or connected with means for controlling the operation of said mechanism and adjusted or rendered sensitive to the waves or disturbances of the source, as set forth.

8. The combination with a source of electrical waves or disturbances, and means for starting and stopping the operation of the same, of a vessel or vehicle, propelling and steering mechanism carried thereby, local circuits controlling said mechanisms, a circuit sensitive to the waves or disturbances of the source and means therein adapted to control the said local circuits, as and for the purpose set forth.

9. The sensitive device herein described comprising in construction a receptacle containing a material such as particles of oxidized metal forming a part of the circuit, and means for turning the same end for end when the material has been rendered sensitive by the passage through it of an electric discharge, as set forth.

10. The sensitive device herein described, comprising in combination a receptacle containing a material such as particles of oxidized metal forming a part of an electric circuit, an electromagnet in said circuit, and devices controlled thereby for turning the receptacle end for end when said magnet is energized, as set forth.

11. The sensitive device herein described, comprising in combination a receptacle containing a material such as particles of oxidized metal forming part of an electric circuit, a motor for rotating the receptacle, an electromagnet in circuit with the material, and an escapement controlled by said magnet and adapted to permit a half revolution of the receptacle when the said magnet is energized, as set forth.

12. The combination with a movable body or vehicle, of a propelling motor, a steering motor and electrical contacts carried by a moving portion of the steering mechanism, and adapted in certain positions of the latter to interrupt the circuit of the propelling motor, a local circuit and means connected therewith for controlling the steering motor, and a circuit controlling the local circuit and means for rendering said controlling circuit sensitive to the influence of electric waves or disturbances exerted at a distance from their source, as set forth.

13. The combination with the steering motor, a local circuit for directing current through the same in opposite directions, a controlling circuit rendered sensitive to the influence of electric waves or disturbances exerted at a distance from their source, a motor in circuit with the steering motor, but adapted to run always in the same direction, and a local circuit or circuits controlled by said motor, as set forth.

Telephone Manufacturing Activity.

President J. E. Keelyn, of the Western Telephone Construction Company, of Chicago, recently made a remark in the hearing of a representative of the ELECTRICAL REVIEW, which, in view of the present condition of the telephone manufacturing interests and the several changes and developments, may be of general interest. "Never in the history of this company has the outlook ahead been so encouraging. We have in sight even a greater number of demands for exchange instruments, switchboard apparatus and telephone equipments for independent exchanges and private installations than our organization anticipated for the season.

"This revival in telephone installation is forcing every department with us practically to its capacity."

With the view of emphasizing these statements, the representative was shown through three great floors of the Western Telephone Construction Company's factory and appearance in the busy shops fully justified the remarks as to the company's activity; the number of large exchange switchboards under construction being especially noteworthy.

Mr. Keelyn further remarked that, within the past six months, quite all their numerous forms of telephone instruments had undergone modifications and improvements to keep pace with the constant advance in the art of telephony, and that he felt more confident than ever that the apparatus bearing their stamp to be more worthy of comparison with the forms of telephone apparatus so generally in use before the growth of the "independent" interests.

Within a comparatively short time, also, Mr. Keelyn has resumed the active personal management of the organization, which, for a time, was given up for the development of certain exchange interests in the northwest. This, in itself, because of his intimate knowledge of the telephone field, should mean much for the company's welfare.

The Brooklyn Elevated Railroad, the Union Elevated Railroad and the Brooklyn Bridge & Seaside Elevated Railroad companies were sold under foreclosure proceedings in the Real Estate Exchange in Brooklyn, N. Y., last Thursday to F. B. Olcott, president of the Central Trust Company and chairman of the Reorganization Committee. Mr. Olcott made one bid on each road as follows: Brooklyn, $1,750,000; Union, $3,075,000, and Seaside, $682,500. The proceedings were taken on behalf of the Central Trust Company. The outstanding first mortgage bonds were: Brooklyn, $3,500,000; Union, $6,150,000; Seaside, $1,365,000. The consolidated company will be known as the Brooklyn Union Elevated Railroad Company. It is said that Frederick Uhlmann, the present receiver of the three roads, will be elected president of the reorganized company.

Telegraphs and Telephones in Persia.

[*From the Journal of the Society of Arts.*]

The first telegraph line in Persia was established about 36 years ago, and in the beginning was vigorously denounced and opposed by the priests as being a species of magic, and closely allied to other evil principles greatly subversive of religion and the best interests of the state, and as such not to be permitted to have a place in the economy of government. This opposition, however, was overcome, and the class which resisted so stoutly at the first now use the telegraph with the greatest indifference. In the year 1862 the construction of a telegraph line from India to England through Persia, Russia and Germany was commenced, and it began working on January 1, 1870. Some work had, however, been carried on for three or four years by a line through the Euphrates Valley; but according to the United States vice-consul at Teheran this was not by any means of a satisfactory character, and serious errors, delays and interruptions occurred. The line is still used occasionally. The Indo-European is a well constructed and efficiently managed line. From Bushire to Karachi there is both a cable and a land line. This line provides the local native administration with one wire which can always be depended upon. The local lines, with the exception of the one wire mentioned above, are the property of the Persian Government. The ownership was acquired by the cost of construction, and has been maintained by defraying the expenses of preservation. The actual administration is deputed to one man, who, until very recently, contributed to the government £2,400 a year. This royalty has now been raised to £6,000 a year. The yearly receipts of the telegraphs have been about £12,000, and the expenditure equals, if not exceeds, the income. In consequence certain reforms are to be initiated in the direction of compulsory payments. It is stated that fully 50 per cent of the telegrams are sent free. Officials of the government (central and local), priests, expounders of the law, relatives of persons connected with the working and the administration, and every one who can provide himself with a reason or excuse, send their telegrams free of expense. As this system has been growing for many years past, and most of those who have benefited by it are in a position to give trouble, the management finds it difficult to introduce changes necessary for their own protection. The Persian local system comprises about 3,100 miles of wire and 86 offices for the receipt and dispatch of messages. The wire provided by the Indo-European administrations, gratis, is about 1,300 miles long, and extends from the Persian Gulf to the Russian frontier. Stamps are not used for any purposes in Persia, except for letters. Messages are restricted to 10 words, at a charge of two and one-half krans (about 9d.). The actual charge for the message is two krans, and the half kran is for the paper on which it is written. In case the message extends to a large number of words, it is calculated at the rate of 10 words to the two krans, and not two and one-half krans. This tariff is the same for any distance in Persia; there is only one charge. The Persian newspapers rarely contain information of sufficient importance to be sent by telegraph; consequently, there is no press rate, and, indeed, there are very few press messages. There are four newspapers in Persia printed in the vernacular, and under government control. These should be issued once a fortnight, but they are often issued at longer intervals; they are in no sense considered as leaders or exponents of the ideas or feelings of the people. As regards telephones, the late Nasredin Shah, on December 8, 1889, granted to the then minister for foreign affairs a concession for electric lighting, the introduction of telephones, phonographs, and the application of electricity to industrial purposes to the whole of Persia, with protection to the monopoly for the period of 60 years. This concession was transferred to an American citizen for a certain valuable consideration, but for want of means the purposes of the concession have not been put into execution. In order to protect the concession from lapsing, two or three wires were put up and kept in a workable state, and are now in use. Five years ago, the railway and tramway company commenced erecting private wires for any one who would undertake the expense, and they established an exchange office on their own premises at Teheran. It has not been extended to any other town. So far, no records have been kept of the number of miles of wire erected, but the vice-consul says that, from his observation, he should estimate it at about 50 miles—this is including the wires into villages of Summer resort, and those to different parts of the city. At the present time there are 15 owners of private wires, each of whom pays the company about 8s. 6d. per month for keeping the wires in repair, and the instruments in order. The receipts about balance the expenditure, but this only includes the free use of the lines by the company, who provide the only office there is in the city, and two in the country during the Summer months. As messages are not received from the public, no tariff has been formulated. Subscribers are put into communication, and use the telephones as long as they wish. As a more extended use of the telephone would interfere with the receipts of the telegraphs, permission to use it has not been granted to distances appropriated by the telegraphs.

ELECTRIC LIGHT FLASHES.

Warsaw, Ky., is agitating the question of an electric light plant.

The Merrill, Wis., Railway and Light Company will rebuild their large plant at Merrill, recently destroyed by fire.

The Lancaster, Pa., Light, Heat and Power Company has executed a mortgage for $100,000, the proceeds to be applied to increasing the capacity of the plant.

Gas engines are to be used for driving the dynamos on the electric lighting plant at King's Lynn, for which Prof. Henry Robinson, of Victoria street, Westminster, London, is the engineer. There will be five engines, each of 100 horse-power, using producer gas as the working agent.

The Healdsburg, Cal., Electric Lighting Company has commenced suit in the Superior Court for an injunction against the city of Healdsburg and board of trustees to prevent the city's sale of $80,000 worth of bonds, for the purpose of constructing a combined system of waterworks and electric lights for Healdsburg.

The president and directors of the Cataract Power Company, of Hamilton, Ont., entertained a large number of guests last Saturday, who were invited to visit the power-house at Decew Falls and the transformer plant on Victoria avenue, Hamilton. Special cars and carriages were provided for the guests, who spent a most enjoyable afternoon in inspecting this latest development of Niagara Falls power.

A petition has been filed with the Circuit Court by John M. Selers and E. A. Noonan, for a receiver and accounting of the affairs of the St. Louis Underground Service Company and the Citizens' Electric Light and Power Company. It is also requested that both companies be reorganized. The plaintiffs state that they are stockholders in the two companies, and charge the officers and directors of both companies with conspiracy to defraud the stockholders.

The Platinum Industry in Russia.

Mr. W. R. Holloway, United States consul-general at St. Petersburg, sends the following translation of an article in the *Novoe Vremia:*

The Urals have been until now the only source from which platinum has been procured for the international market. Its part formed over 95 per cent in the universal production of that precious metal. A small group of platinum mines, concentrated in the Verkhotursk district of the government of Perm, includes about 70 separate mines, of which only 40 are being worked, and the remaining 30 are either inactive or under investigation. During 1897, the production of platinum amounted to about six tons, of which separate enterprises produced the following amounts: Mines of Count P. P. Shuvaloff, one ton 396 pounds; mines of Count Demidov San Donato, one ton 144 pounds; mines of J. Burdakov & Sons, 1,512 pounds; mines of Kolly, 1,404 pounds; mines of Andreieff heirs, 1,188 pounds; mines of Koenigsberger, 1,008 pounds; mines of P. A. Konukhoff, 792 pounds; mines of 19 small proprietors, 1,620 pounds.

Two of the above named mines passed, in 1897, into the hands of foreigners. In the beginning of September, other enterprises were sold to a syndicate from Paris, with a capital of several million francs. The price was fixed according to the productiveness of the mines, estimating a ton of platinum from $798,250 to $957,900; thus, for example, a mine having a yearly output of 360 pounds was estimated at from $128,750 to $154,500; a mine worth a yearly output of 625 pounds was sold at from $309,000 to $386,250.

From the above it is seen that there are only seven great platinum enterprises in the Urals, of which five have been purchased by foreigners. By the sale of these mines Russia has lost the advantages which she could acquire from platinum industry. While platinum mines were in the hands of Russians, the whole of the raw metal was sent abroad, and the income from the manufacture of platinum articles was in the hands of foreigners. During later years the Russian platinum owners tried to get rid of the foreign purchasers, but the mines have now passed into the hands of foreigners. When one considers that no new veins of platinum have been discovered during late years, that those now existing will soon be exhausted, and that no other platinum mines have been found in the Urals, one must come to the conclusion that the Russians have lost an important industry, and the only one which enjoyed a monopoly of the world's supply.

A New Spring Lock Binding-Post.

The accompanying illustrations show a new and novel binding-post which is manufactured by the Williams Electric Company, Cleveland, Ohio, under a patent owned by them and applied to their double and single-pole telephone receivers and magneto bells. Fig. 1 is an elevation in one

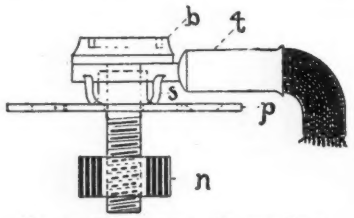


FIG. 1.—ELEVATION OF SPRING LOCK BINDING-POST.

direction. Fig. 2 is the same elevation in the opposite direction, showing how the binding-post is applied to the cabinet work of the magneto bells.

Fig. 3 is a plan view of the binding-post looking down upon it.

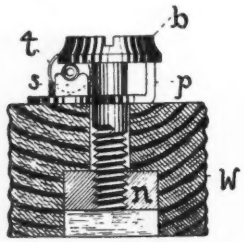


FIG. 2.—SECTIONAL VIEW OF SPRING LOCK BINDING-POST.

The body or base-piece of the binding post is formed from spring-sheet Craig silver, and has turned up from the same piece of metal two spring clips S, which form a saddle or rest for the receiver-cord-tip T. Screw B on being rotated in the right-hand direction screws through the nut until one side of the screw-head grips the receiver-cord-tip T, and on further rotation the screw locks the connec-

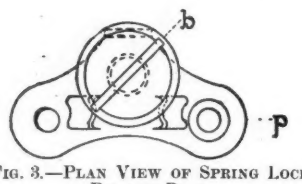


FIG. 3.—PLAN VIEW OF SPRING LOCK BINDING-POST.

tion, screw B forces down the spring saddle S by spreading the limbs slightly outwardly until the screw engages the upwardly turned flange or base-piece P, and in this manner forms a perfect spring lock for the receiver-cord-tip.

Fig. 1 shows the binding-post, just after the screw-head has engaged the receiver-cord-tip. Fig. 2 shows the binding-post after screw B has forced the receiver-cord-tip down lower and locked it by engaging the upwardly turned flange P on the opposite side of the screw-head. After screw B is forced down until it engages flange P, Fig. 2, resistance is offered to the movement of the cord-tip in either direction by the tendency of either one of the limbs to straighten up and grip the cord tip still tighter.

The Schmidt & Bruckner Telephones.

The Schmidt & Bruckner Electric Company, New York, are now placing upon the market a new style of adjustable telephone arm, which embodies several new departures from the black enameled arm now so universally used. It is shown on this page.

The Schmidt & Bruckner Electric Company have constructed and applied for patent on the arm that is claimed to overcome all the former objections, and combines excellent electrical and mechanical design with a handsome appearance. Two strong steel rods connect the transmitter with the base and serve as conductors for the two sides of the circuit. At the base these rods are set in a hard-rubber socket and connect with springs on the inside of the socket. These springs are of phosphor bronze, V-shaped, and make rubbing contacts with the side flanges, and thereby allow for full play of the arm. A heavy finger nut of special make regulates the pressure of the springs and tension of the arm. The flanges are fastened to a block of hard rubber on the front of the coil-box, and thus are insulated from each other. In the base is set a special-wound coil easily removed when repairs are necessary. The transmitter is of the American coal grain pattern and may be removed from the arm by one screw.

All the parts, in fact, are distinct in themselves and may each be removed separate. This they claim is a distinct advantage, materially cheapening and quickening repairs over any other arm on the market. The company have received congratulations from all parts of the country on the new arm, and orders are coming in faster than can be handled. The company is branching out into many specialties, both in regard to interior and exchange apparatus. Their manufacturing facilities for turning out fine work are of the best. They make a specialty of selling transmitters separate, and the demand is continually on the increase for this line of goods. Their transmitter was described in a former issue, and is well known to the telephone buyer.

The Schmidt & Bruckner Electric Company advise us that they will be pleased to send sample of their new arm or other parts to any parties desiring to investigate their apparatus. They have also a very handsome "poster" that will be mailed for the asking.

An Enclosed Arc Lamp for Power Circuits.

The General Electric Company has developed a substantial, simple and efficient power-circuit enclosed arc lamp for use, two in series on 220-volt

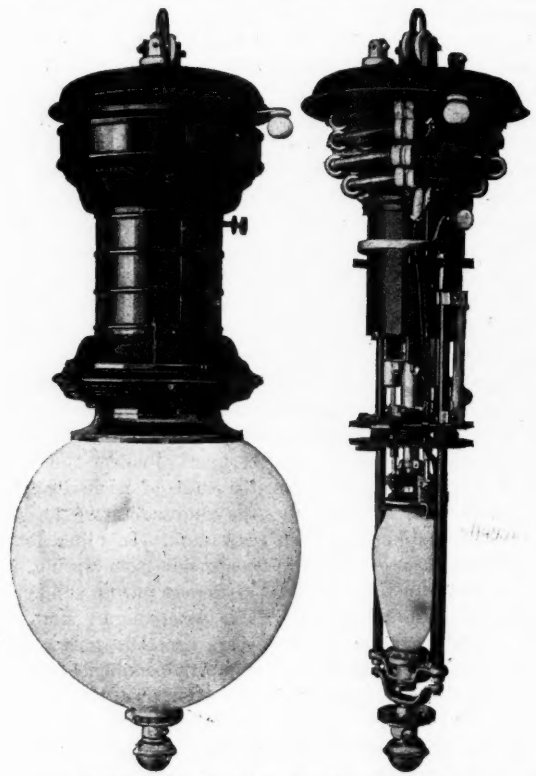
THE SCHMIDT & BRUCKNER IMPROVED ARM TELEPHONE TRANSMITTER.

circuits, or five in series on 500-volt circuits. In outward appearance it resembles the alternating direct-current carbon-feed enclosed arc lamps of the same company, and is manufactured in both single and double-globe types.

To conform to insurance regulations covering the use of arc lamps on high-voltage circuits, a safe, positive and reliable cutout is incorporated in the lamp, together with an extra set of resistance coils. Should the carbons stick or the lamp for any reason fail to operate, the cutout sends the current through these subsidiary resistance coils instead of through the carbons without detriment to the lamp. The efficiency of this cutout has been demonstrated by cutting out lamps in circuit and allowing them to remain cut out for several consecutive hours without resultant injury either to coils or lamp.

The mechanism is simple, and made of but few parts. The carbon is fed by a double cam clutch, smooth and positive in action. An adjustable resistance in the upper part of the lamp allows it to be employed two in series on circuits of 200 to 240, or five in series on circuits of 500 to 600 volts. With one 12-inch positive and one five and one-half negative one-half-inch carbons, it burns, after one trimming, for from 130 to 150 hours, and after the run the remainder of the positive carbon can be used in the lower carbon-holder for a second run of equal duration. The current required is five amperes.

The lamp is furnished with the globe-lowering device, which has been fitted to over 30,000 General Electric enclosed arc lamps, and which permits the globe to be lowered gently by merely turning a milled thumb screw at the side of the casing. The globe-holder is locked automatically by a single upward movement of the globe-holder. Power-circuit lamps are furnished in weatherproof black or brass casings. Fig. 1 shows the weather-proof casing.



AN ENCLOSED ARC LAMP FOR POWER CIRCUITS.

A Straight Metallic Express Telephone Switchboard.

The Victor Telephone Manufacturing Company, of Chicago, has recently succeeded in developing a most efficient and well-constructed straight metallic-circuit telephone switchboard, which they claim will fulfill all the requirements of an ideal switching apparatus. A telephone exchange using this switchboard, by adopting as a basis a straight metallic system with double circuit cords and with the ringing and listening circuits normally cut out on both sides, can be readily divided into metallic, common return or ground circuits and, at the same time, have each division separate from the others. This can be done without any change in the wiring and, as the boards are made up in complete sections, each of five complete drops, jacks and individual ringing keys, any section can be easily inserted or removed.

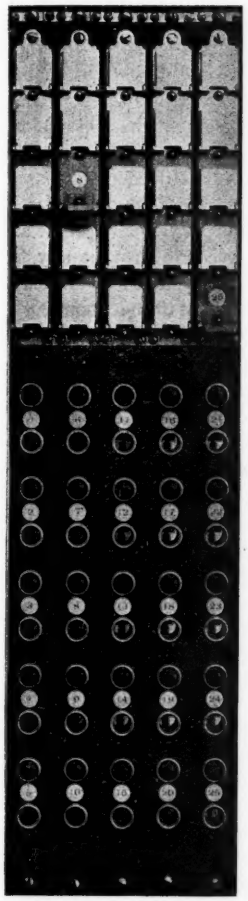


FIG. 1.—FIVE SECTIONS OF VICTOR TELEPHONE SWITCHBOARD.

In Fig. 1 is shown a front view of five such sections, assembled ready for placing in position in the cabinet. The drops are arranged vertically from the top, and, for numbering, little celluloid disks are supplied, which are pressed into recesses sunk in the first strip. Blanks are supplied for numbering trunk or toll-line sections. The jacks and ringing keys, arranged in the same way, are placed below the drops. An individual ringing key is provided for each line, so that any subscriber can be called, whether the plug is in the jack or not, or if any two subscribers are connected either one can be called without ringing back on the other line.

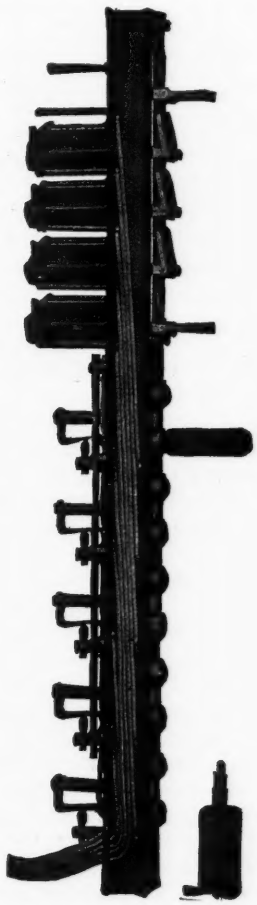


FIG. 2.—SIDE VIEW OF A SECTION OF THE VICTOR TELEPHONE SWITCHBOARD.

In Fig. 2 is shown a side view of the section of the Victor board illustrated in Fig. 1. The arrangement of drops, jacks and keys is clearly shown, the upper coil being removed, showing the ease with which this can be done; it is only necessary to rotate the coil a quarter turn and withdraw it from the strip. The wiring details and the arrangement of the several parts of the section are shown in Fig. 3. The wiring of each section is complete in itself, all the wires being concealed in a vertical groove, so that when the board is connected up no wires are seen either on the front or back. In the construction of the drop magnet several new features are embodied. It is of the tripolar type, with the armature placed so as to obtain the highest efficiency. The coils are wound in layers with silk-covered wire, and can be removed without taking out any screws. As the coils are not in series there is no retardation or counter electro-motive force to affect the telephone current. Therefore, to change to a toll line jack for very long distances it is merely necessary to replace the drop coil with one of higher resistance.

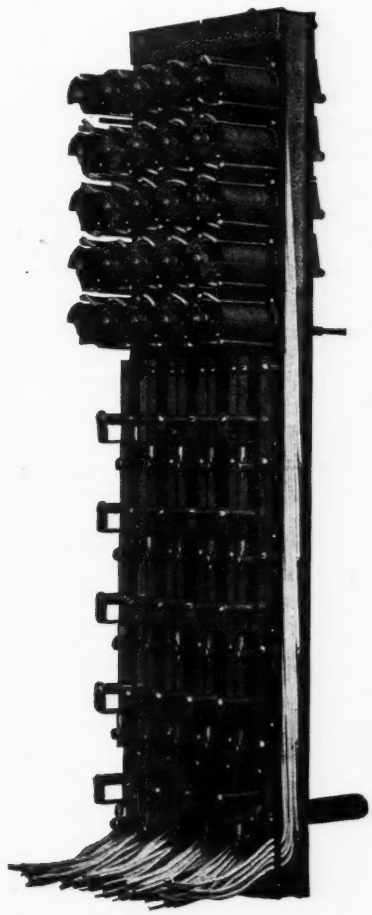


FIG. 3.—WIRING DETAILS OF A SECTION OF THE VICTOR TELEPHONE SWITCHBOARD.

The Michigan Electric Company.

The new building of the Michigan Electric Company, at 101 Woodward avenue, Detroit, will be ready for occupancy December 1. If this company is enabled to remove to the new quarters by that date, it will mean that within 60 days of the loss by fire of their previous establishment they will have entirely reconstructed and restocked a supply-house which, the officers of the company say, will be equal to anything of the kind in the country. In addition to the retail and wholesale business in every character of electrical goods, the company are adapting the entire top floor of the new building for repair and workshops, where such labor as commutator repairs and armature winding may be done. Mr. Lockwood, of the Michigan Electric Company, has very recently visited houses of this character in New York, Chicago and St. Louis, in search of suggestions for giving the new organization every facility, with the idea of making the future history of the company even more important than the past.

The Central Electric Company.

The new establishment of the Central Electric Company, 264 to 270 Fifth avenue, Chicago, which includes the better part of the entire block, is equal in system and management to any of the great departmental stores which have so revolutionized all the lines of retail business. The enormous growth of the electrical industry and the almost universal adaptation of electricity for the accomplishment of every sort of result from light, heat and power to the simple economies of daily life, have made it important that such stations of supply as the Central Electric Company, of Chicago, should exist where every element for electrical requirements of the standard and approved manufacture could be found.

It is interesting to note in connection with such a large stock of electrical equipments that the greater number of special devices used in construction for telephone, electric light and street railways have within a very few years undergone radical changes. It may be that in this idea alone lies the success of the Central Electric Company, because the stocks of goods in all departments are so constantly being exhausted and replenished.

During the Fall season, the sale of "Okonite" wires and cables, for which this company are western agents, has been unusually large, indicative, perhaps, of the increased activity of all electrical interests in the West. The sale, too, of "Sawyer-Man" incandescent lamps, for which this house has exclusive command in the West, has been greater than might be anticipated even during the active season for electric light matters.

The demand for street railway supplies, as well as the various telephone equipments always carried in stock by this house, has been strong, and the general outlook, as taken from the standpoint of this company's view, shows better things ahead for electrical enterprise.

EXPERIMENTS ON INDUCTION COIL CONDENSERS.

BY ALFRED G. DELL.

The following experiments are continuations of those described in the ELECTRICAL REVIEW of July 20 and August 24, 1898 The same apparatus was used, with the addition of an adjustable condenser of five microfarads capacity—one microfarad divided into tenths and the remaining four into units.

The adjustable condenser, with the one in the base of the separate interrupter, gave me the use of about seven microfarads, the fixed one from tests being found to be about two microfarads capacity. In making the experiments the four-inch coil was in circuit at all times and its interrupter locked, unless otherwise stated. The sketch of connections published August 24, 1898, is used.

I connected the adjustable condenser, one side to *g* and the other to *h*; between *h* and *i* I placed a telephone receiver. Having the switches *k* on *c* and *l* on *e*, I proceeded to test for battery currents passing in and out of the condenser. With the break of the separate interrupter open, I heard a click in the telephone receiver whenever a circuit-breaker was closed.

With the break points of the interrupter together, I also heard a faint click at closure of the circuit-breaker. I failed to distinguish any difference in the intensity of the sound by varying the condenser capacity.

I then released the interrupter on the induction coil, and with the break of the separate interrupter closed, and the circuit arranged so the current would pass over the break points of the separate interrupter, and a Crookes tube attached to the secondary of the induction coil, and with a fluoroscope, I proceeded to test for effects on the light received in the fluoroscope by varying the adjustable condenser, the switches of the separate interrupter being *k* on *c* and *l* on *d*. I failed to detect the slightest difference even with the seven microfarads in shunt with the separate interrupter's closed break.

I locked the interrupter on the induction coil, and with the telephone receiver arranged as mentioned above, I worked the break with my finger. I heard a faint click at closure and a very loud one at opening of the break points. I then attached a small induction coil, one pole to *i* and the other to *h*, in place of the telephone receiver, closing the interrupter and current receiver of the small coil. I attached two Geissler tubes, one in the secondary of the small coil and the other in the secondary of the four-inch coil. The switches were *k* on *c* and *l* on *e*, the adjustable condenser was connected to *g* and *h*. I found the light obtained in the tube attached in the four-inch coil was very bright and steady, but the light in the other tube was rather poor and inclined to reverse its electrodes, but no decided reversal. An increase of capacity seemed to increase the light in the faint tube. From the above experiments it appears that a quite small portion of the current in the primary passed around the break points into the condenser at every make of the interrupter, and at every break the main portion of the current started from the break, and the small portion from the condenser.

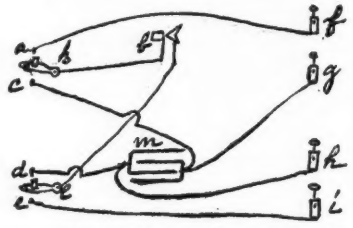


DIAGRAM ILLUSTRATING "EXPERIMENTS ON INDUCTION COILS."

With this arrangement, the sparks at break points of the interrupter were very bright. I removed the condenser from the secondary of the small coil mentioned above and attached up the break of the interrupter, which is run by its core, to the adjustable condenser, and energized the coil by a weak cell of battery. I found two-tenths microfarad appeared to be the proper capacity. The spark obtained from it in its secondary was exceedingly small; with no condenser it was scarcely perceptible, and after additions to the two-tenths microfarad capacity, it fell in length to almost zero.

I attached up to the secondary of the coil a Geissler tube, and found when the two-tenths microfarad was in use, the tube was beautifully lighted up, and the striæ were very fine, and each stratification was distinctly marked, and all in the narrow tubing. When I threw off the two-tenths microfarad, the striæ became longer, they being pushed into the five small bulbs attached at the ends, and along the tube. On turning the dials from the two-tenths microfarad upwards, I found the striæ lengthened the same as without a condenser, until I reached about three microfarads, they then disappeared, excepting some undeveloped long ones near the cathode. The tube appeared now with the reddish light extending almost continuously the whole length between the electrodes. I found that the above almost entire disappearance of the striæ could not be obtained only with a very favorable battery. On putting in use another microfarad, the light became unstable, the tube appearing fully lighted up one moment and dark the next. I then put into use the whole five microfarads, and the tube became entirely dark, excepting a glow around each electrode.

In no case could I distinguish any difference in the intensity of the light whenever the tube was lighted up. I now come to the most interesting part of my experiments. I attached a Crookes tube to the secondary of the four-inch induction coil, and with a fluoroscope, placed on a rest in front of the tube, I proceeded to examine the variations of the light obtained by varying the capacity of the condenser. I found with the two microfarads in the base of the separate interrupter I had a good light, but occasionally there would be a bright flash at the interrupter break and a dark space seen in the fluoroscope, especially if the interrupter was set for a slow break. I timed the dials of the adjustable condenser and thought I could discover a difference in the light. I then, to reduce the intensity of the light, edged books between the tube and fluoroscope, placing in one of the books a metallic object, and found, as I moved the dials of the condenser around, the light obtained began to clear, and the outlines of the object became more distinct, until I reached a certain limit, it then began to grow dimmer again. I found the best capacity was between three and one-half and four and one-half microfarads. Between those capacities it was very difficult to distinguish any variation in the light. With four microfarads in use there appeared to be an entire absence of the sudden flashes at break of the interrupter mentioned above, and, of consequence, no dark spaces seen in the light obtained in the fluoroscope. I found varying the running of the interrupter by means of the weight, or using a strong cell of battery to actuate the break made no difference in the light obtained or capacity required, providing the interrupter was not run at a very great number of breaks per second, as obtained, for instance, by running the weight entirely.

The interrupter attached to the four-inch coil acts precisely on the separate interrupter, it requiring the same additional condenser capacity for the most favorable light, indicating its condenser capacity of two microfarads, for long-connecting wires.

I tried 2.1, 4.2 and 6.3 volts, and found I required the same capacity for the most favorable light in the fluoroscope. Whether by varying the current strength I would have obtained different results I can not state, as Iam not prepared to vary the current strength satisfactorily.

The spark lengths, with four microfarads in use, was slightly longer than with two microfarads. When 2.1 volts were used the increase of length of spark was difficult to determine with 4.2 volts, but appeared to be longer. With the 6.3 volts I could not determine the length at all.

I am confident that any improvement in the dielectric increasing the capacity of the condenser, but diminishing its size, would greatly improve the results in X-ray work.

It is not enough to make the condenser only large enough to destroy the spark at break, when the best results are wanted. The following appears to me to be the cause of the intensity of light obtained in Geissler tubes, being independent of the condenser:

The spark in the secondary is made by the fall at break of the primary current being more sudden, which is the function of a condenser. When there is no condenser in use, the energy produced by the fall of current and, of consequence, the magnetism of the core of the coil, occupies more time than when a condenser is in use. The same is true of a static machine—the revolving plate or plates produce the energy and the Leyden jars the sparks by condensation, whereas in the coil the sparks are made by the sudden fall of the current in the primary circuit.

The discharges from the secondary of the coil consist of a series of impulses, each one separate and distinct from the preceding or following ones. Each impulse represents the energy between a break and the next make.

Extension of Telephone Service in Maine.

The New England Telephone and Telegraph Company has connected the following places in Maine with its system of toll lines: Calais, Eastport, Lubec, North, South and West Lubec, Whiting, Dennysville, Pembroke and Perry.

FOREIGN ELECTRICAL NEWS.

Searchlights for Captive Balloons—In order to ascertain the possibility of attaching searchlights to captive balloons, a series of tests have lately been made by the Russian Minister of War. As far as the electric installations were concerned, the tests appear to have given very gratifying results. The current was supplied to the lamp of the projector by means of conductors woven with the cable used in restraining the balloon. At a height of 600 meters a projector of 5,000 candle power lit a space of about 500 meters in diameter. In the opinion of some, balloons furnished with searchlights would be more dangerous than useful in time of war, since their presence alone would reveal the position occupied by the army employing them. The same argument might, however, be applied to war vessels equipped with projectors.

FIG. 1.—TYPE "K" TRANSFORMERS, 1,000 WATTS AND 600 WATTS CAPACITY.

The Electrolytic Decomposition of Marine Salt—According to an announcement made by Messrs. Siemens & Halske, of Vienna, the apparatus of the Kellner system, intended for the decomposition of marine salt, furnishes the most advantageous results for the preparation of hypochlorites, in localities where the cost of electric energy and the price of chloride of soda are not too high. Besides the installation now in active progress at Hallein, in the establishment of Kellner, Partington & Company, a factory equipped with a force of 40 horse power has been established at Perlen near Lucerne, and another installation of a force of 200 horse-power is now in course of construction in the workshop of Messrs. Scholler & Company at Torda.

Snow and Telephone Wires—The *Nouvelle Gazette de Zurich* publishes an interesting note on the weight of snow lodged on telephone wires. In ordinary weather this weight does not exceed two or three centigrams. During heavy falls of snow, however, it is not unusual for this weight to be increased to a considerable extent. The meteorological station at Zurich estimates at one fifth the average specific weight of snow that fell on April 2 last. This gives, on 100 meters of wire, a weight of 60 kilograms, or more than 40 times the weight of the wire itself. Between the two posts supporting the 250 wires traversing the Lurimat, at a distance of about 100 meters apart, the additional weight from the snow was about 15,000 kilograms. If to this is added the appreciable tension resulting from a sudden fall in the temperature to the neighborhood of zero, the explanation is at once forthcoming why there are so many sudden breakages of the wires along this line. The writer in the *Nouvelle Gazette* adds that these phenomena must be counted with, and the great dangers shown that result from the presence of telephone wires in the neighborhood of electric currents at high tension used in the majority of towns.

The Use of Arc Lamps as Telephones—This, although well within the range of the possible, is as yet but little practiced. The flame of the arc lamp is very sensible and is affected by the very feeble variations produced in a neighboring circuit traversed by an alternating current. If a microphone is inserted in this neighboring circuit, the arc will reproduce, with great fidelity, the different sounds and noises by which the microphone is affected. In the same way, a sound received by the arc will produce in its circuit a modification in the resistance and a variation in the current, effects which would affect a telephone. The arc lamp can then be utilized with as much facility as a telephone transmitter as a receiver. These results are very easily obtained, but it would be well to remember, when telephoning in this manner, to protect the eyes with a pair of smoked glasses.—*L'Electricien.*

Electricity in Japan—The progress which Japan is making in electrical matters is as gratifying as her progress in other directions. In 1896 there were 20,000 kilometers of telegraph lines in the empire, and 1,122 telegraph offices. The number of messages sent amounted to 22,500,000. At this period the telephone was still in its infancy in the empire, the number of central stations being only six, with 870 kilometers of line and 3,232 subscribers. Since then it has, however, increased in all three directions to a considerable extent. In Tokyo the electric light companies own five central stations and supply light to 40,000 lamps. There are also two companies engaged in electrical transportation and in supplying power for mechanical purposes, etc. These companies produce about 30,000 horse-power, which they transmit to a distance of from 55 to 60 kilometers. Similar companies exist in various parts of the empire. At present there are only two electric railroads in existence in the country, the towns where this system is in operation being Kyoto and Nagayo. It is proposed, however, to build an electric railway in the capital, and several other lines are about to be established in various centers.

The Type "K" Transformer.

The illustrations presented herewith show the type "K" transformer built by the Pittsburgh Transformer Company, of Pittsburgh, Pa. The iron core is in the form of a rectangular letter "O," upon the long sides of which the windings are placed. There are two primary and two secondary coils, the primary being wound directly upon the secondary. The transformer is mounted in a cast iron case and may be operated dry or immersed in oil. The leads are brought out through porcelain bushings, the primary at the rear corners and the secondary at the front.

The manufacturers state that in these transformers they use only the very finest grade of electrical sheet steel. This is rolled from especially selected billets and annealed to specifications that are the result of years of experiment. They guarantee the iron to be the finest procurable, to be uniform in quality, and to be free from deterioration under the longest service. The transformer is liberally proportioned and sufficient iron and copper are employed to confine the induction to the lowest limits, so that the iron losses are exceedingly small.

Copper of the largest permissible cross section is used in the windings, and in the larger sizes thin strips in multiple are used. The manufacturers state that these transformers when operated in oil will safely carry overloads of 25 per cent for periods up to five hours, with a temperature rise of 45 degrees centigrade above the air. Thorough tests with 10,000 volts alternating current are made of all transformers before shipment. The Pittsburgh Transformer Company give very liberal guarantees with all the apparatus manufactured by them.

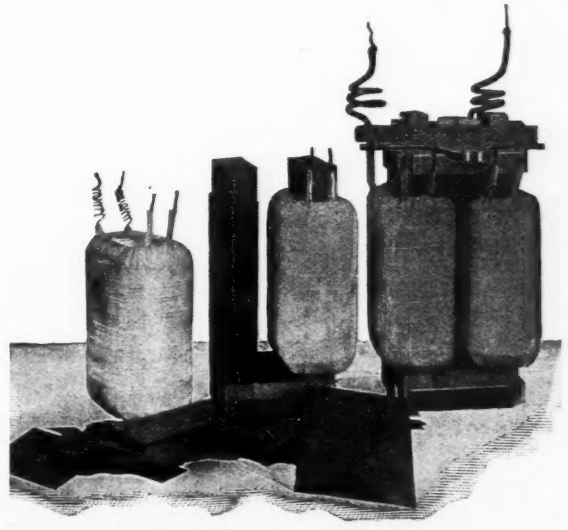


FIG. 2.—1,000 WATTS TYPE "K" TRANSFORMER, SHOWING CONSTRUCTION.

ADVANCE INFORMATION

New Incorporations.

CLEVELAND, OHIO — The Abbott Electric and Manufacturing Company has been incorporated to manufacture and sell electrical and manufacturing devices, and carry on a general machine business. The incorporators are H. H. Hammond, H. I. Wickes, William A. Marbach, Samuel Abbott and C. B. Abbott; capital stock, $15,000.

PORTLAND, ME. — The Mitchell-Parson Electric Company has been incorporated; capital, $150,000; incorporators, Geo. A. Copeland, Revere; Wm. E Pearson, Winthrop, Mass.

CLEVELAND, OHIO—International Fac-Similigraph Company has been incorporated to manufacture devices for electrical transmission of photograph plates; capital stock, $25,000.

New Telephone and Telegraph Companies.

EMPORIA, KAS.—The Missouri & Kansas Telephone Company has decided to build a telephone line from this city to Council Grove. This company will also construct a telephone line from this city to Newton.

HARRISBURG, PA.—The Pennsylvania Telephone Company has let the contract for a new line between Hamburg and Auburn, taking in Pinedale, Port Clinton and Auburn.

COLUMBUS, OHIO—The Kenton Telephone Company has been incorporated, with $30,000 capital stock, to operate a telephone system from Kenton to Marion, Marysville, Bellefontaine, Wapakoneta and Lima. The incorporators are Ed L. Barber, James S. Brailey, J. C. King, C. E. Guilford and Horton Park.

ASHBURNHAM, MASS.—Another effort is being made to have the telephone system introduced here.

PULTENEY, N. Y.—A telephone exchange, with 27 subscribers, has been established here.

NEWBERRY, S. C.—The telephone line between this place and Clinton has been completed and is in working order; L. W. Floyd, manager.

NEW LONDON, IOWA—The Henry County Telephone Company has been incorporated. E. A. Stephenson, president; J. E. Peterson, secretary, and Dr. G. M. Van Ausdall, treasurer.

NEBRASKA CITY, NEB.—Henry A. Coit, of St. Louis, has secured a franchise from the city permitting the erection and operation of another telephone exchange. The rates provided in the ordinance are $24 per year for business houses and $12 for residences. Work has already been commenced on the new line.

PULASKI, N. Y.—A telephone line is being erected between Pulaski and Port Ontario. Dr. Frank A. Box and Charles Tollner, of this place, and William F. Place, of the Port, are at the head of the movement.

ST. PAUL, MINN.—The Minnesota Central Telephone Company has extended its line to this place. The lines connect with Ortonville, Appleton, Brown's Valley, Elbow Lake and the intermediate points on the lines on which these towns are located.

LORAIN, OHIO—The Northern Ohio Telephone Company, of Lodi, have been granted a right of way for erecting and maintaining a telephone system in Greenwich. This line now connects Lodi, Spencer, Wellington, Oberlin, Clarksfield, Norwalk, New London and Ashland, and will soon be connected with this place.

TIFFIN, OHIO—The Home Telephone Company is constructing a line to the villages of Berwick, New Riegel and McCutchenville. This company is also extending a line from Bettsville to Kansas.

SUFFOLK, VA.—The Isle of Wight Telephone and Telegraph Company has been incorporated to operate a telephone line between Suffolk and Smithfield. The officers are J. W. Thomas, Smithfield, president; J. U. Burgess, Suffolk, vice-president; J. W. Holladay, Smithfield, secretary and treasurer; W. N. McAnge, Suffolk, general manager.

SHERMAN, N. Y.—A local telephone system has been put in at this place. About $400 has been subscribed for the purpose.

GREENSBURG, KY.—Green County Telephone Company has been incorporated, with a capital stock of $3,500.

GERMANTOWN, KY.—The Germantown, Minerva & Maysville Telephone Company has been incorporated by J. F. Walton, S. D. Rigdon, T. M. Dora, Evan Lloyd and others.

HENDERSON, TENN.—City Clerk may be addressed concerning proposed electric light and street railway service.

SPARTA, TENN.—The extension of the Gainesboro Telephone Company's line to Spencer from this city will be completed in about 10 days.

SIOUX CITY, IOWA—A contract has just been closed by the Home Telephone Company, of this place, and the Independent Telephone Company, of Des Moines, with Pierce, Waterbury & McAllister, of Mason City, for the construction of a metallic circuit line from this place to Des Moines. Preliminary work on the line will be commenced early next week, and it is to be completed and in operation by September 1, 1899. The line through the Des Moines exchange will give this place connection with the independent lines to the east and southeast and with the Haneman independent lines to the southwest as far as Topeka, Kas. It also will afford Des Moines and these east, southeast and southwest independent lines connection through the Sioux City exchange with northern Nebraska, the Dakotas and Minnesota.

New Electric Railways.

WILMINGTON, DEL.—There is talk of extending the Wilmington & Brandywine Springs Electric Railroad to the Pennsylvania state line shortly and then connecting with another road.

NORWALK, OHIO—It is authoritatively stated that a new electric road will soon be built between this city and Sandusky. The new line is being engineered by Messrs. Clark Rude, of Sandusky, and Mr. W. W. Graham, of Norwalk. The proposed route takes in North Monroeville and will extend from Norwalk to Bellevue.

PORTLAND, IND.—All the surveys for the electric line between Albany and Pennville, passing through Dunkirk, have been completed, and it is expected that work on the line will begin as soon as possible.

OXFORD, N. Y.—Work has been begun again on the Sidney-Franklin Electric Road.

DANSVILLE, N. Y.—There is talk of a stock company being formed to build an electric railroad from this place to Mount Morris and then on to Geneseo and Conesus Lake.

CHICAGO, ILL.—Illinois Traction Company has been incorporated; capital, $10,000; incorporators, August Kelly, Thomas S. Jackson, Clara L. Clayton.

WARSAW, IND.—Articles of incorporation have been filed with the Secretary of State for the Warsaw Street Railway Company. Noah Clodfelter, Charles G. Lohman, incorporators; the capital stock, $30,000.

DAYTON, OHIO—The Dayton & Xenia Traction Company has been incorporated; capital stock, $300,000.

INDIANAPOLIS, IND. — Congressman Henry is interested in the project to build an electric line from Elwood, via Perkinsville and Noblesville, to this place.

OWOSSO, MICH.—The Detroit & Pontiac Electric Railway will extend its line to this place.

SCHUYLERVILLE, N. Y.—An electric road will soon be constructed between this place and Greenwich. Mr. J. D. Powers, formerly of Glens Falls, is interested in the project.

DAYTON, OHIO—The Dayton & Eastern Traction Company has been incorporated by Henry B. Pruden, George E. Wright, H. O. Cox, William A. Mays and W. S. McConnaughey, to operate an interurban electric railway; capital stock, $10,000.

CORUNNA, MICH. — An electric railway will be constructed between Pontiac and Owosso.

AGAWAM, MASS.—An electric railway will probably be constructed from this place to West Springfield.

NEW ALBANY, IND. — There is some talk of organizing a company to build an electric railroad from this city to Paoli along the line of the turnpike. The proposed road would touch the villages of Mooresville, Galena, Greenville, Palmyra, Fredericksburg and Hardensburg.

Electric Light and Power.

PAYNVILLE, N. Y.—The Electric Light Company have begun extending their line to this place.

HAGERSTOWN, MD.—The Mayor may be addressed concerning establishment of electric light plant.

FRANKLIN, TENN.—D. F. Gardner is reported to be interested in the establishment of an electric light plant.

WOODSFIELD, W. VA.—The Town Clerk may be addressed concerning electric light plant, for which bonds will be issued.

YAZOO CITY, MISS.—L. G. Montgomery is reported to be interested in the establishment of an electric light plant.

CHICAGO, ILL.—The El Porte Zuelo Light and Power Company has been incorporated; capital, $500,000; incorporators, Chester D. Crandall, William M. Carpenter, William R. Patterson.

AYER, MASS.—Ayer Light and Power Company has been incorporated, with George A. Beatey, president; W. M. Sargent, treasurer; capital stock, $50,000.

Business Troubles

MADISON, WIS. — The People's Electric Company has made a voluntary assignment for the benefit of its creditors, with C. K. Tenney as the assignee.

PHILADELPHIA, PA.—The American Electric Meter Company has made an assignment for the benefit of creditors.

Increase of Capital.

ISLIP, N. Y.—The capital stock of the Patchogue Electric Light Company has been increased from $20,000 to $30,000, for the purpose of erecting a new brick plant at the river, place therein a 1,000-horsepower dynamo and other improvements, and to extend the lines through Blue Point, Bayport and Sayville.

Through the kindness of Mr. H. C. Roberts a representative of the ELECTRICAL REVIEW was shown through the new store of the H. C. Roberts Electrical Supply Company, 831 Arch street, Philadelphia. The store, situated on one of the busiest streets of Philadelphia, is 140 feet long by 30 feet wide, and is arranged in different departments. The front is used for the display of a general line of electrical goods, a separate compartment being provided for each different line. In the rear is a shipping department where the goods are packed and shipped to their destination without interfering with the retail business. The store is fitted throughout with all the modern improvements and lighted by the new General Electric Midget arc lamps. The basement is filled with a large quantity of reserve stock, in order to meet any sudden demand or large order. It is the intention of the company to further increase their floor space by cutting out a stairway to the floor above, and to use the extra space afforded for the installation of a new line of goods.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED NOVEMBER 8, 1898.

613,669 Brush-holder; A. E. Doman, Elbridge, N. Y.—A brush-holder having a frame or support, combined with a brush-clamp secured thereto by a ball-and-socket joint.

613,688 Electric switch; F. A. La Roche, New York, N. Y.

613,705 Electric timing race apparatus; J. I. MacDonald, St. Joseph, Mo.—Consists of a dial, a hand co-operating therewith, mechanism for actuating the hand, a hydraulic speed-regulating device for said mechanism, an escapement controlling said speed-regulating device, a standard clock operating said escapement, and means for arresting the motion of the hand-actuating mechanism at will.

613,708 Electric railway; J. F. McLaughlin, Philadelphia, Pa.—Consists of a main conductor and a sectional working conductor, multiple switches, each arranged to couple a group of successive sections of the working conductor in proper sequence to the main conductor, and means for operating the switches by the passage of a car over the groups of sections controlled by said switches.

613,735 Electric circuit controller; Nikola Tesla, New York, N. Y.—Consists of rigid and fluid conductors adapted to be brought intermittently into contact with each other, thereby making and breaking the electric circuit, and means for imparting rotary motion to both of said conductors.

613,778 Indicator signal; P. Rabbidge, Sydney, N. S. W.

613,794 Electric railway; W. M. Brown, Johnstown, Pa.—A movable member normally connected with the low-potential side of the circuit, but disconnected therefrom and forming a connection between the high-potential side of the circuit and the conductor section when temporarily moved by the action of the passing car.

613,809 Method of, and apparatus for, controlling mechanism of moving vessels or vehicles; Nikola Tesla, New York, N. Y.—The improvement in the art of controlling the movements and operation of a vessel or vehicle, which consists in establishing a region of waves or disturbances, and actuating by their influence exerted at a distance the devices on such vessel or vehicle, which control the propelling, steering and other mechanism thereon.

613,853 Electric regulator; W. H. Chapman, Portland, Me.—Consists of a solenoid having a differential winding mounted on a tube or cylinder, and having its magnetic core fitted as a piston to said cylinder, a passageway leading from one end to the other of said cylinder, and means for closing said passageway to a greater or less degree.

613,858 Cap for enclosing arc lamps; C. E. Harthan, Lynn, Mass.

613,864 Phosphorescent electric lighting; D. M. Moore, Newark, N. J.—A vacuous receptacle, a frame consisting of aluminum plates jointed together by rods of aluminum, said frame being held in place by portions of the walls of the receptacle forced inward at the sides of said plates, a shaft journaled in bearings in this frame, a break-wheel on said shaft, a contact brush bearing thereon, magnet armatures also on said shaft, and means exterior to said receptacle for rotating said armature with a continuous motion.

613,869 Controlling device for electric motors; F. J. Russel, New York.

613,880 Generating and distributing electric energy; C. M. Green, Cleveland, Ohio—A method of connecting a constant-current dynamo having two or more armature circuits with two or more lamp circuits consisting in arranging the connections so that one or more of the armature circuits of the dynamo shall be interp sed between the lamp circuits and the voltage kept within safe working limits.

613,881 Generating and distributing electric energy; C. M. Green, Cleveland, Ohio—An armature having its coils or bobbins divided into two or more successive or adjoining sets, light insulation between the individual coils or bobbins of each set and heavier insulation between the sets of coils or bobbins.

613,882 Generating and distributing electric energy; C. M. Green, Cleveland, Ohio.

613,894 Dynamo and electric motor for driving vehicles; J. V. Sherrin, Ramsgate, Eng.

613,899 Instrument for measuring electric currents; E. C. Eldredge, Springfield, Mass.

613,918 Electric-lighting system for vehicles; R. N. Chamberlain, Belleville, N. J.

613,955 Flashlight apparatus; S. D. Alter, Philadelphia, Pa.—Consists of an electric igniter separated from, and free from, contact with the mass of flash-powder, and a fuse connecting said electric igniting device with the powder.

614,012 Primary battery; C. Koenig, Germany.

614,025 Brush-holder for dynamo-electric machines; G. L. Pratt, Atlanta, Ga.—A motor, a brush holder and means operating automatically, when the current is cut in, to cause the brushes to move into engagement with the commutator, and means operating automatically, when the current is cut out, to move the brushes out of engagement with the commutator.

The Fostoria Incandescent Lamp Company have opened an eastern office in the White Building, 95–97 Liberty street, New York city. This will also be the eastern office of the Crouse-Tremaine Carbon Company.

The Manhattan Electrical Supply Company, 32 Cortlandt street, has just issued its catalogue No. 10, and between its covers appear 336 pages of interesting and elaborately illustrated and described electrical apparatus. Every one interested in electrical supplies should send for a copy of this comprehensive and up-to-date catalogue, which we understand will be sent on request.

ACTIVE SOLICITORS WANTED EVERYWHERE for "The Story of the Philippines" by Murat Halstead, commissioned by the Government as Official Historian to the War Department. The book was written in army camps at San Francisco, on the Pacific with General Merritt, in the hospitals at Honolulu, in Hong Kong, in the American trenches at Manila, in the insurgent camps with Aguinaldo, on the deck of the Olympia with Dewey, and in the roar of battle at the fall of Manila. Bonanza for agents. Brimful of original pictures taken by government photographers on the spot. Large book. Low prices. Big profits. Freight paid. Credit given. Drop all trashy, unofficial war books. Outfit free. Address F. T. Barber, Sec'y, Star Insurance Bldg., Chicago.

Another Injunction in Favor of the Marks Enclosed Arc Lamp.

The injunction issued October 18, 1898, by Judge Coxe, restraining the Washington Mills Company, New York, from infringing the Marks-Ransom enclosed arc method patent, and the permanent injunction issued November 5, by Judge Lacombe, against the Electric Construction Supply Company, manufacturers of the Kinsman lamp, has been held to apply to the enclosed arc lamps manufactured by the General Electric Company. By the order of the court 40 of this company's enclosed arc lamps have been removed from the factory of the Washington company, Lawrence, Mass, and other lamps of the same type, but licensed under the Marks patents by the Marks Enclosed Arc Light Company, are now being substituted. It is held that the General Electric lamps infringe the Marks-Ransom patent, and are enjoined under clause 4 of the Kinsman injunction decree, issued November 5, 1898, which reads as follows:

"That an injunction issue herein directed to the said defendants, Electric Construction and Supply Company, Fred A. Kinsman and Charles E. Rocap, perpetually enjoining and restraining the said defendants, their officers, employés, agents, servants, clerks and attorneys, and all persons acting under them or their authority, or in privity with them, and each and all of them, from infringing the said letters patent, No. 520,996, and particularly from infringing claims 1 and 2 thereof; and from making, using, selling, offering for sale or causing to be made, used, sold or offered for sale, any electric arc lamps embodying or employing in their operation or use the method or methods set forth in claims 1 and 2 of said letters patent, and from making, using, selling or offering for sale, or causing to be made, used, sold or offered for sale, any electric arc lamps like or substantially like the lamp heretofore sold and offered for sale by the defendant Electric Construction and Supply Company, variously described by the defendants as the "Kinsman" lamp, the "Kinsman 150-hour lamp" and the "Kinsman long-burning arc lamp."

Claims 1 and 2 of the patent in question—issued to L. B. Marks, June 5, 1894—read as follows:

1. The method of operating an arc lamp on constant-potential circuits which consists in confining the arc within an enclosure restricting practically all the drop of potential in the arc circuit to the arc and continuously maintaining said drop at a point which prevents an excessive flow of current.

2. The method of operating an arc lamp consisting in confining the arc within an enclosure from which the air is excluded or to which it has difficult access and maintaining a long arc to produce a larger than normal drop of potential, whereby an arc light of normal intensity may be maintained by an amperage lower than normal.

There are many manufacturers of the enclosed arc lamp who will be interested in this decision and the wording of the above claims. A number of the manufacturing companies are licensed by the owners of the Marks patents, but this does not include all the manufacturers.

Electrical Patents
Given Special Attention.
HENRY S. THORNBERRY,
Solicitor of Patents,
WASHINGTON, D. C.
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Kindred.... ...Interests

The Wilhelm Telephone Company, of Buffalo, are now represented by Messrs. J. E Fuller and J. S. Cook in New York city.

The Farr Telephone Company occupy large salesrooms at 357 Dearborn street, Chicago, and manufacture practically all the telephone apparatus which they handle.

Mr. B. M. Barr, formerly western sales agent of the Walker Company, has just taken charge of the Stirling Company's business in New York, and his office is located at 126 Liberty street.

Decker & St. Clair, the general contractors for the new church in Winsted, Ct., have let the contract for furnishing the structural ironwork in the building to the Berlin Iron Bridge Company, of East Berlin, Ct.

It is stated that the Westinghouse Electric and Manufacturing Company is shipping from its Pittsburgh plant $700,000 worth of apparatus each month, which are the largest shipments ever made from the works.

"The Electrical Trade," a unique little publication, issued by the Electric Appliance Company, of Chicago, is one of the brightest little journals of the kind in the field. Mr. W. W. Low, the president of the Electric Appliance Company, speaks most encouragingly as to the outlook of electrical interests in the West.

The Western Electric Company has distributed a bulletin giving a full description and price list of the Western Electric non sparking brushes. These brushes are very satisfactory in eliminating the sparking at the commutator. Upon request a copy of this bulletin will be sent to any one who has not received one.

In addition to the monthly bulletin sheet of telephone apparatus issued by the Farr Telephone and Construction Company, of Chicago, the company have just gotten from the press for general distribution an artistic catalogue, known as "Catalogue No. 6." It is comprehensive in illustrations, prices and descriptions of telephone instruments, switchboard apparatus and telephone specialties.

During the past Summer the Joseph Dixon Crucible Company, of Jersey City, N. J., have added an extension to their pencil factory, 40 by 90 feet, three stories high, driven by electric power from generator placed in the main factory. The Dixon company was established in 1827, but during all of its more than three-score years and ten of busy life, no year has in any way equaled 1898 for volume of business; its plant has been running continuously, yet the company is behind its orders in all departments. As the Dixon company's products go into every known field of industry, the rise or fall of the volume of business done by the Dixon company may be taken as a very excellent standard or pointer on the condition of business generally.

The Finest Calendar of the Century.—Those who receive the new calendar for 1899, given by *The Youth's Companion* to all new subscribers, will be ready to allow that the publishers have pretty nearly accomplished their object, which was to produce the finest calendar of the century. The subject of the exquisite color piece which forms the center is "The Ideal American Girl," and it is depicted in the most delicate tones, as well as the most brilliant shades. The calendar is so designed that no printing appears on the lithographed panels, and they may be preserved as permanent ornaments, suitable for the prettiest corner of the house. Not only is this calendar a gift to all subscribers to the 1899 volume, but all new subscribers receive also the remaining issues of *The Companion* from the time of subscription until January 1, 1899, free, then for 52 weeks, a full year, to January, 1900. A beautiful illustrated announcement of the principal contributions engaged for the 1899 volume will be sent free to any one addressing *The Youth's Companion*, 211 Columbus avenue, Boston, Mass.

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